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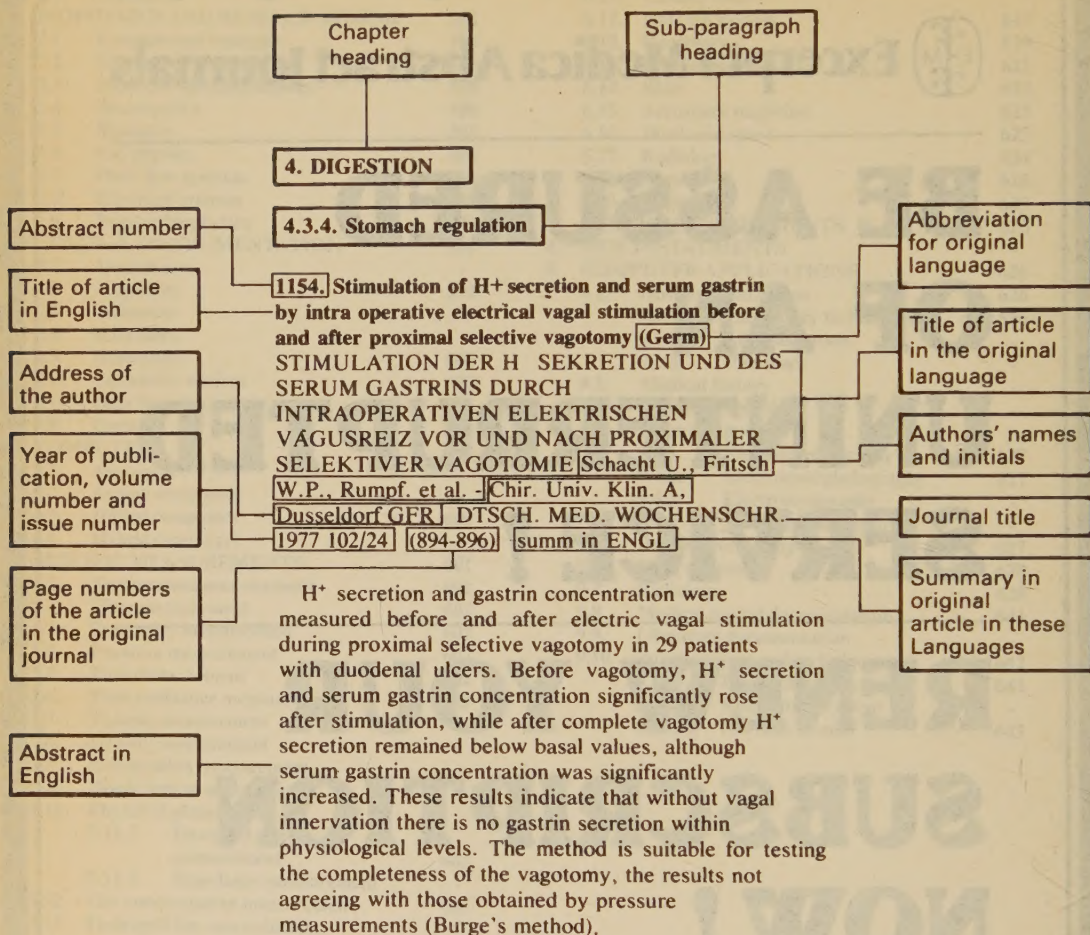
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1. GENERAL ASPECTS

1.2. Components

3421. Recently developed elastomers for facial prostheses - Gonzalez J.B. - Dept. Dent., Mayo Clin., Rochester, Minn. 55901 USA - MAYO CLIN. PROC. 1978 53/7 (423-431)

Ever since ancient times, man has been searching for the proper artificial substitute for living tissue. This has been a most frustrating and challenging task for the scientific community involved. Prosthetic restoration is the only alternative to reconstructive surgery for the facially deformed. This paper reviews the progress that has been made in recent years in developing a suitable material for the prosthetic restoration of facial defects. There is encouraging evidence that the development of an ideal material for facial prostheses is an attainable goal.

2. BIOPHYSICS AND BIOENGINEERING

3422. A mathematical analysis of human leukocyte antigen serology - Nau D.S., Markowsky G., Woodbury M.A. and Amos D.B. - Computer Sci. Dept., Duke Univ., Durham, N.C. USA - MATH. BIOSCI. 1978 40/3-4 (243-270)

This paper presents and explores a comprehensive mathematical model for human leukocyte antigen serology, based on a mathematical formalization of the concept of specificity. This model is general enough to take into account such factors as absorption, elution, cross-reactivity, and incomplete immunization. The paper includes a presentation of the relevant immunological background and a short discussion of the underlying computational difficulty of the basic problems. Upper and lower bounds are derived for the minimal number of specificities required to explain a given set of HLA reactions, and it is shown that the numbers of antibodies and antigens involved must be no less than this minimal number of specificities. Other techniques and theorems are also presented to aid in reducing and analyzing HLA reaction matrices.

3423. Water permeability of gramicidin A-treated lipid bilayer membranes - Rosenberg P.A. and Finkelstein A. - Dept. Physiol., Albert Einstein Coll. Med., Bronx, N.Y. 10461 USA - J. GEN. PHYSIOL. 1978 72/3 (341-350)

In membranes containing aqueous pores (channels), the osmotic water permeability coefficient, $P(f)$, is greater than the diffusive water permeability coefficient, $P(d)$. In fact, the magnitude of $P(f)/P(d)$ is commonly used to determine pore radius. Although, for membranes studied to date, $P(f)/P(d)$ monotonically declines with decreasing pore radius, there is controversy over the value it theoretically assumes when that radius is so small that water molecules cannot overtake one another within the channel (single-file transport). In one view it should equal 1, and in another view it should equal N , the number of water molecules in the pore. Gramicidin A forms, in lipid bilayer membranes, narrow aqueous channels through which single-file transport may occur. For these channels it is found that $P(f)/P(d)$

approximately = 5. In contrast, for the wider nystatin and amphotericin B pores, $P(f)/P(d)$ approximately = 3. These findings offer experimental support for the view that $P(f)/P(d) = N$ for single-file transport, and it is therefore concluded that there are approximately five water molecules in a gramicidin A channel. A similar conclusion was reached independently from streaming potential data. Using single-channel conductance data, the authors calculated the water permeability of an individual gramicidin A channel. In the Appendix the authors report that there is a wide range of channel sizes and lifetimes in cholesterol-containing membranes.

3424. A model for anomalous rectification: electrochemical-potential-dependent gating of membrane channels - Ciani S., Krasne S., Miyazaki S. and Hagiwara S. - Dept. Physiol., Brain Res. Inst., UCLA, Los Angeles, Calif. 90024 USA - J. MEMBR. BIOL. 1978 44/2 (103-134)

A model is presented for 'anomalous rectification' based upon electrical measurements on the egg cell membrane of the starfish. The objective is to postulate a plausible molecular mechanism which yields an expression for the conductance similar to that deduced empirically by Hagiwara and Takahashi (1974), i.e., $G(K) = [Bc(K)^{1/5}]/[1 + \exp(\Delta V - \Delta V(h)/v)]$, where B , $\Delta V(h)$ and v are constant, $c(K)$ is the external K^+ concentration, and $\Delta V (= V - V_0)$ is the displacement of the membrane potential from its resting value. It is shown that a similar dependence of the conductance on ΔV is expected for a particular class of models in which the K^+ ions are also implicated in 'gating'. To give a specific example, we consider the case in which the formation of ion-permeable pores requires a voltage-induced orientation of membrane-bound, electrically-charged groups and subsequent complexation of these groups with the external cations. Furthermore, the proportionality between $G(K)$ and $c(K)^{1/5}$, when the internal K^+ concentration is constant, is accounted for by conventional descriptions of the ionic fluxes using Eyring's rate reaction theory. In terms of the present model, B and $\Delta V(h)$ are explicit functions of the internal K^+ concentrations and are thus constant only as long as this is unvaried. The particular value of v required to fit the data ($v \approx 8.4$ mV) is rationalized by the assumption that each of the orientable groups carries three negative elementary charges. In addition, the predictions of the present model are compared with those deduced from an alternative viewpoint, which is related to Armstrong's 'blocking particle hypothesis', in that the probability for opening and closing of the pore is assumed to depend on whether the pore is occupied or empty. Differences and similarities between the two models, as well as ways to discriminate between them, are discussed.

3425. Gas permeability and pore size distribution on porous membrane: Effect of metal coating (Japa) - Yamamoto M. and Nakajima K. - Toyota Cent. Res. Developm. Lab. Inc., Nagoya JPN - MEMBRANE 1979 4/1 (61-67) - summ in ENGL

The effect of the reduction in specific surface area and pore size distribution on the gas permeability has

been studied in porous polypropylene film with sputtered metal coating. There is an empirical relation $1/Q = a + b/\Delta p$ between flux Q and difference pressure Δp in a porous membrane. There exists a limit of flux Q in porous membrane and this shows drastic decrease with reduction in specific surface area. Pore size distribution changes remarkably with increasing the thickness of the metal coating film on porous membrane. The coating effect appears especially in the pore size range from 20A to 80A. It was found that the gas permeability is affected largely by the change of pore size distribution.

3426. Cell-membrane and rheological mechanisms: Dynamic osmotic hemolysis of human erythrocytes and repair of ghosts, as studied by resistive pulse spectroscopy - Yee J.P. and Mel H.C. - Div. Med. Phys., Lawrence Berkeley Lab., Univ. California, Berkeley, Calif. 94720 USA - *BIORHEOLOGY* 1978 15/3-4 (321-339)

Normal human erythrocytes undergoing abrupt osmotic hemolysis display a single, transient, localized circular rupture over 15 to 20% of their total surface area. An immediate and striking drop in apparent volume for such cells, as measured by electronic 'sizing' using resistive pulse spectroscopy (RPS), is ascribed primarily to a greatly increased, flow-induced, cell-membrane deformation and associated expulsion of ghost contents rather than to an intrinsic property of hemolysis per se. The time and flow-rate dependence of the RPS spectra measure the rates of ghost formation and repair of the hemolytic lesion in the membrane. Restored ghosts rehemolyze at a critical volume and lesion size similar to those of the original lysing cells. Membrane rather than cytoplasmic (internal viscosity) properties dominate deformability measured from RPS spectral shape.

3427. A new model for estimating concentrations of substances emitted from a line source - DeTar D.F. - Dept. Chem., Florida State Univ., Tallahassee, Fla. USA - *J. AIR POLLUT. CONTROL. ASSOC.* 1979 29/2 (138-141)

Extensive theoretical and experimental investigations of atmospheric diffusion have shown that the concentration of a substance at a receptor downwind from a source can generally be represented by a gaussian function. Prior implementations of gaussian models have usually been based on the incorrect implicit theory that the vertical dispersion constant σ_z is nearly independent of the time required for the substance to go from source to receptor. In the present study we have explored the behavior of a model based on the theory that σ_z is some type of function of time. Application of the new model to data from the GM sulfate experiment requires σ_z to be directly proportional to time. We find that the new model correctly reproduces the trends of the experimental data for the entire set of available downwind values, and it also reproduces the values obtained on the median strip if a minor empirical correction is applied to allow for an upwind thrust of SF_6 due to traffic wake. The new model is applicable, therefore, to all receptor heights, to all receptor distances, to all wind speeds, to all wind

directions. The reason why the theoretical defect of previous models has not shown up sooner is due to absence of sufficiently accurate experimental data in the critical region: wind speeds below about 2 m sec⁻¹ and distances less than 50 m from the source, together with reliable data measured at a sufficiently extensive series of receptor heights and distances from the source. The new model further predicts that concentrations of a substance at a remote receptor will be independent of crosswind speed (and, hence, of wind speed). The prediction is also in agreement with the available GM data.

3428. An application of a pseudo-second order SO₂ reaction algorithm to urban air pollution modeling - Laird A.R. and Miksad R.W. - Univ. Texas, Austin, Tex. 78712 USA - *J. AIR POLLUT. CONTROL. ASSOC.* 1979 29/2 (147-152)

Observed particulate sulfur distributions in Houston, Texas indicate that local point sources of SO₂ may contribute significantly to local particulate sulfur concentrations. This paper investigates the influence of the chemical reaction scheme (first or second order) used to describe the oxidation of SO₂ to sulfate in a short term air quality model for an area like Houston. The air quality model used was the Texas Episodic Model (TEM) developed by the Texas Air Control Board. Predicted spatial distributions of sulfur concentrations were computed for Houston by using both the existing first order oxidation scheme of the TEM, and by using a pseudo-second order algorithm for catalytic oxidation of point source SO₂ emissions. Comparison of model predictions to measured distributions show that for half-lives ranging from 0.5 to 6 hours the sulfur levels and distributions predicted by the first order oxidation scheme did not agree with observation. Sulfur levels predicted by the pseudo-second order scheme agreed much better with observed spatial distributions and individual monitoring site values. Sulfur distributions and site values predicted by the pseudo-second order scheme were not found to be sensitive to reasonable variations in SO₂ oxidation rates.

3429. Sensitivity analysis of a salt deposition model for natural draft cooling towers - Overcamp T.J. and Israel G.W. - Environm. Syst. Engin., Univ., Clemson, S.C. 29631 USA - *ATMOS. ENVIRON.* 1979 13/1 (61-69)

A salt deposition model for natural draft cooling towers was modified so that different modeling assumptions could be tested. These included the method of estimating the effective height of emission of droplets as a function of their size and the use of either a simple trajectory method or a modified Gaussian diffusion-deposition equation for computing the deposition. This model was tested using two different emission droplet size distributions. The major conclusions are that the trajectory method can give comparable results to the diffusion-deposition equation for droplets greater than several hundred micrometers in diameter, and that the deposition predictions within the first kilometer or two are very sensitive to the emission droplet size distribution and the method of predicting the effective height of emission of the droplets.

3430. Mathematical model of a regulation of oxidative phosphorylation in intact mitochondria - Bohnensack R. and Kunz W. - Inst. Physiol. Chem., Med. Akad., 301 Magdeburg DDR - ACTA BIOL. MED. GER. 1978 37/1 (97-112) - summ in GERM

A mathematical model of the regulation of mitochondrial ATP synthesis by the extramitochondrial ATP/ADP ratio is presented taking into account the transport processes of phosphate and of adenine nucleotides by their specific translocators. In agreement with known experimental data the model describes the control of respiration by the extramitochondrial ATP/ADP ratio as well as the distribution of adenine nucleotides and of inorganic phosphate between the extramitochondrial and the intramitochondrial compartment. In the extramitochondrial compartment the phosphorylation potential is predicted by the model to be higher than in the matrix space. Despite the differences in the phosphorylation potentials no particular translocation energy is necessary. This has been achieved by postulating a charge compensation between the movement of adenine nucleotides and the uptake of phosphate during ATP synthesis. The proton stoichiometry of the proton pump must be higher than stated by chemiosmotic coupling hypothesis in its present form, otherwise sufficient results can not be obtained. With increasing activities of non-phosphorylating energy requiring side reactions (as uncoupling) at first the difference of the respiration rates between the phosphorylating and the non-phosphorylating state disappears, at higher activities the ADP phosphorylation stops, but the membrane potential collapses at very high activities only.

3431. Models for the insulin response to intravenous glucose - Hagander P., Tranberg K.G., Thorell J. and Distefano J. III - Dept. Surg., Lund Univ., Lund SWE - MATH. BIOSCI. 1978 42/1-2 (15-29)

The Grodsky packet storage model describes many features of insulin release, but at present more or less arbitrary simplifications are necessary. The consequences of various simplifications are discussed, especially with regard to identification of parameters thought to be of importance for glucose tolerance. In particular, the insulin release dynamics of the ordinary intravenous glucose tolerance test is examined. The proposed model contains the following features: It considers arterial rather than venous blood glucose concentration as the stimulus, it takes the glucose injection time into account, and it contains a positive derivative term during the rise of the glucose concentration. When the insulin elimination-rate time constant is fixed to an a priori value, model fitting gives a clear quantification of the sensitivity of early and late insulin release to glucose.

3432. ACE: A system which analyses complex explanations - Sleeman D.H. and Hendley R.J. - Dept. Computer Studies, Univ. Leeds GBR - INT. J. MAN-MACH. STUD. 1979 11/1 (125-144)

This paper discusses a Problem Solving Monitor which has been implemented to provide a supportive environment for students solving a non-deterministic task, the interpretation of nuclear magnetic resonance

spectra. In particular, this paper discusses the facility which allows the student to give an explanation in Natural Language and which comments on this. The explanations considered here are complex as they involve a series of arguments, which in turn consist of a series of facts and a deduction. The protocols which were collected from various student problem solving sessions are analysed in some detail and the inconsistent and incomplete nature of the dialogues is stressed. A system which is able to cope with these deficient dialogues is presented.

3433. Adequacy of measurements in compartmental modelling of metabolic systems - Brown R.F., Carson E.R., Finkelstein L. et al. - Dept. Syst. Sci., City Univ., London GBR - MED. BIOL. ENG. COMPUT. 1979 17/2 (216-222)

The adequacy of present-day measurement techniques for the compartmental modelling or metabolic systems is investigated using numerical examples and analysis of experimentally obtained plasma clearance curves. It is concluded that the model parameters obtained are often of questionable accuracy. The situation can be improved by careful monitoring of experimental conditions and judicious spacing of data points on the response curve, but the work shows a clear need for a continuous (or semicontinuous) method of monitoring plasma concentration. To resolve ambiguities between models equally plausible on physiological grounds, it is necessary to monitor the dynamics of internal variables, for example, of the concentration in the liver (which is nowadays possible noninvasively).

3434. Compartmental models with uncertain flow rates - Harrison G.W. - Dept. Mathemat., Univ. Georgia, Athens, Ga. 30602 USA - MATH. BIOSCI. 1979 43/1-2 (131-139)

It is often extremely difficult to obtain precise values for the flow rates in compartmental models. Hence, in this paper it is assumed that the rate coefficients lie within known intervals, though they may fluctuate in time. A method is given to compute upper and lower bounds at any time t for the concentration $x_i(t)$ in each compartment of any system whose coefficients remain in the given intervals. The bounds computed are the best possible, since there is some such system with $x_i(t)$ equal to the bound.

3435. Polarized infrared spectroscopy of oriented purple membrane - Rothschild K.J. and Clark N.A. - Dept. Phys., Univ. Boston, Mass. 02215 USA - BIOPHYS. J. 1979 25/3 (473-487)

Polarized Fourier transform infrared spectroscopy has been used to study the structure of purple membrane from *Halobacterium halobium*. Membranes were oriented by drying a suspension of membrane fragments onto Irtran-4 slides. Dichroism measurements of the amide I, II, and A peaks were used to find the average spatial orientation of the bacteriorhodopsin α -helices. By deriving a function that relates the observed dichroism to the orientational order parameters for the peptide groups, helical axis distribution, and mosaic spread of the membranes, the average orientation of the α -helices was found to lie in

a range less than 26° away from the membrane normal, agreeing with electron microscopic measurements. The frequency of the amide I and A peaks is at least 10 cm^{-1} higher than values found for most α -helical polypeptides and proteins. This may indicate that bacteriorhodopsin contains distorted α -helical conformations.

3436. Structure determination of asymmetric membrane profiles using an iterative Fourier method - Stroud R.M. and Agard D.A. - Dept. Biochem. Biophys., Univ. California, San Francisco, Calif. 94143 USA - BIOPHYS. J. 1979 25/3 (495-512)

An iterative Fourier method is applied to solving and refining the electron density profile projected onto the line perpendicular to a membrane surface. Solutions to the continuous X-ray scattering pattern derived from swelling of multilayer systems or from membrane dispersions can be obtained by this technique. The method deals directly with the observed structure factors and does not rely on deconvolution of the Patterson function. We used this method previously to derive the electron density profile for acetylcholine receptor membranes (Ross et al., 1977). The present paper is an analysis of the theoretical basis for the procedure. In addition, the technique is tested on artificially generated continuous-scattering data, on the data for frog sciatic nerve myelin derived from swelling experiments by Worthington and McIntosh (1974), and on the data for purple membrane (Blaurock and Stoekenius, 1971). Although the method applies to asymmetric membranes, the special case of centrosymmetric profiles is also shown to be solvable by the same technique. The limitations of the method and the boundary conditions that limit the degeneracy of the solution are analyzed.

3437. The evolution of sexual reproduction as a repair mechanism. Part II. Mathematical treatment of the wheel model and its significance for real systems - Williams R.M. and Walker I. - Dept. Appl. Mathemat. Theoret. Phys., Cambridge CB3 9EN GBR - ACTA BIOTHEOR. 1978 27/3-4 (159-184)

The dynamics of populations of self-replicating, hierarchically structured individuals, exposed to accidents which destroy their sub-units, is analyzed mathematically, specifically with regard to the roles of redundancy and sexual repair. The following points emerge from this analysis: 1. A population of individuals with redundant sub-structure has no intrinsic steady-state point; it tends to either zero or infinity depending on a critical accident rate $\alpha(c)$. 2. Increased redundancy renders populations less accident prone initially, but population decline is steeper if α is greater than a fixed value $\alpha(d)$. 3. Periodic, sexual repair at system-specific intervals prevents continuous decline and stabilizes the population insofar as it will now oscillate between two fixed population levels. 4. The stabilizing sexual interval increases with increased complexity provided this is accompanied by appropriate levels of redundancy. 5. The model closely simulates the dynamics of heterosis effects. 6. Repair fitness is a population fitness: the chance of an individual being repaired is a function of the statistical living $\alpha > \alpha(c)$

either engage in sexual repair of the population as a whole at that particular period. Populations living at the appropriate time or they die out. 7. The mathematical properties of the model illustrate mechanisms which possibly played a role in the evolution of a mortal soma in relation to sexual reproduction.

2.1. Fundamental concepts

3438. A new method for testing Gaussian processes - Manole O. - Grup Scolar I.M.T., Timisoara ROM - BIOL. CYBERN. 1978 30/3 (125-128)

A method of testing gaussian processes, based on the characteristic function, is presented. An evaluation of possible gaussian inclusions in some stochastic processes is also proposed.

3439. Non-parametric evidence of homeo- and heteropoietic treatment effects in stratified cross-over designs (Germ) - NICHTPARAMETRISCHER NACHWEIS VON HOMEO- UND HETEROPOIETISCHEN BEHANDLUNGSWIRKUNGEN IN GESCHICHETEN ÜBERKREUZUNGSPLANEN - Lienert G.A. - Lehrst. Psychol., Univ. Erlangen-Nürnberg GFR - METHODS INF. MED. 1978 17/4 (287-290) - summ in ENGL

Two non-parametric tests are suggested for detecting two different types of treatment effects in stratified samples of patients. The tests are based on cross-over-designs in which each patient is rated twice as responding better to a new treatment T or to a standard treatment S. If patients from all strata react alike, the treatment effect is, by testing, defined as heteropoietic. Asymptotic χ^2 testing and decision making is illustrated by a numerical example from psychopharmacology.

3440. Induction/catastrophe theory: A behavioral ecological approach to cognition in human individuals - Dockens W.S. III - Univ. Uppsala SWE - BEHAV. SCI. 1979 24/2 (94-111)

Gibson's (1966) ecological formulation of perceptual processes as abstracted systems, the tenets and units of neobehaviorism as formulated within psychobiology and the experimental analysis of behavior, and the topological approaches of mathematical biology as formulated by Rashevsky (1951, 1960) and Thom (1975) are the elemental concepts that form the basis of the theory presented in this paper. A cognitive or decision process of individual human beings, living systems at the organism level, emerges as a one-step, match-contrast, serial pattern embedded as a triplet of Gibson frames in a five-dimensional butterfly catastrophe. Some of the experimental, clinical and philosophical implications of a 'catastrophic' formulation of induction are discussed.

3441. Error analysis and optimal estimation procedures in identification of nonlinear volterra systems - Marmarelis V.Z. - Biomed. Electric. Engin., Univ. South. California, Olin Hall Engin., Los Angeles, Calif. 90007 USA - AUTOMATICA 1979 15/2 (161-174)

In the problem of nonlinear system identification the

white-noise (crosscorrelation) method has become increasingly popular during the last five years. Since the ideal white noise is physically unrealizable, the method employs quasi-white test signals approximate its statistical properties to a satisfactory and determinable degree. A family of such signals (CSRS) which has been recently introduced appears to be most advantageous in nonlinear system identification. Its principal advantage is that it allows the thorough and effective error analysis and, consequently, the optimization of the identification procedure. This paper presents that error analysis and outlines the optimal procedures which ought to be followed for the optimal application of the method to nonlinear Volterra systems identification.

3442. An exact penalty function algorithm for solving general constrained parameter optimization problems - Gesing W. and Davison E.J. - Dept. Electric. Engin., Univ. Toronto CAN - AUTOMATICA 1979 15/2 (175-188)

An exact penalty function type of algorithm is proposed to solve a general class of constrained parameter optimization problems. The proposed algorithm has the property that any solution obtained by it will always satisfy the problem constraints, and that it will obtain a solution to the constrained problem, within a given specified tolerance, by solving a single unconstrained problem, i.e. it is not necessary to solve a sequence of unconstrained optimization problems. The algorithm applies a modification of Rosenbrock's polynomial boundary penalty function, and a negative exponential penalty function with moving parameters, to modify the objective function in the neighbourhood of the constrained region; a robust unconstrained algorithm is then used to solve the resulting unconstrained optimization problem. Some standard test functions are included to show the performance of the algorithm. Application of the algorithm is then made to solve some computer-aided design problems occurring in the area of control system synthesis.

3443. Control of linear systems with multiparameter singular perturbations - Khalil H.K. and Kokotovic P.V. - Coordinated Sci. Lab., Dept. Electric. Engin., Univ. Illinois, Urbana, Ill. 61801 USA - AUTOMATICA 1979 15/2 (197-207)

The singular perturbation theory is extended to systems with several small parameters which can change the system order. Difficulties arising in testing the boundary layer stability in multiparameter linear problems are discussed. The theory is applied to linear quadratic optimal control and Nash game problems.

3444. Forces causing osmotic pressure - Scheie P.O. - Dept. Phys., Texas Lutheran Coll., Seguin, Tex. 78155 USA - J. THEOR. BIOL. 1979 77/1 (47-50)

An analysis of forces acting on a simple system that includes a solvent, solute, and a semipermeable membrane shows the basic mechanism of osmotic pressures can be expressed as any of three forces: that due to the interaction of solute particles with the semipermeable membrane; that due to the cohesiveness of the solvent; or that due to the solute

particles interacting with the free surface of the solvent.

3445. An algorithm to ascertain critical regions of human tracking ability - Repperger D.W., Ward S.L., Hartzell E.J. et al. - Aerospace Med. Res. Lab., Wright-Patterson AFB, Dayton, Ohio 45433 USA - IEEE TRANS. SYST. MAN CYBERN. 1979 9/4 (183-196)

A statistical algorithm is developed to study human tracking behavior in a precognitive tracking task. The algorithm presented here determines the point in time when a tracking task becomes too difficult for the human to follow. Consequently, different behavior responses are observed to occur. A decision rule based on a statistical test of normality is used to delineate the two regions of tracking behavior. The proof of convergence of this algorithm to a unique solution is given. Data from a good and poor tracker are analyzed using this algorithm to illustrate how to utilize the approach presented here.

2.2. Mechanical systems

3446. Biomechanical properties of the human stratum corneum (Fren) - LES PROPRIETES BIOMECHANIQUES DU STRATUM CORNEUM HUMAIN - Agache P. and Ferguson J. - Clin. Dermatol. Univ., Hop. St-Jacques, 25030 Besancon Cedex FRA - REV. INST. PASTEUR LYON 1978 11/2.SUPPL. (291-299)

The biochemical properties of the stratum corneum are of fundamental importance for its protective function, but they are only one of the elements of its physiological role. In fact, this transparent thin pellicle also plays a vital role as a barrier against the penetration of external agents and the escape of water and of the internal constituents of the organism. It constitutes an indispensable protective breastplate against exogenous physical, chemical and energetic aggressions. It is above all to the stratum corneum that the cosmetic appearance of the human skin is due. It is a dead organ that, nevertheless, is born, is transformed and disappears in a continuous fashion in close connection with the subjacent tissues and possesses its own physiology like any living organ. Its importance in the survival of the species is such that one may ask whether the final task of the living epidermis is not to engender it. Physiological and biochemical studies reveal its very great complexity. In short, the stratum corneum has more surprises in store for us.

3447. An experimental test for the evaluation of cutaneous elasticity (Fren) - MISE AU POINT D'UN TEST EXPERIMENTAL DE L'EVALUATION DE L'ELASTICITE CUTANEE - Khellaf F. and Boulanger J.P. - Inst. Pharm. Indust. Lyon, Univ. Claude-Bernard Lyon I, 69008 Lyon FRA - REV. INST. PASTEUR LYON 1978 11/2.SUPPL. (301-313)

Thanks to rheological and x-ray diffraction studies it was possible to find proof of definite positive effects of certain products. It now remains to determine what these may be: lubrication of the fibres, or a better rearrangement of the collagen fibres by interfibrillary junction. This will, without a doubt, be the object of future works.

3448. Biomechanical failure in osteosynthesis - Gallinaro P., Crova M. and Calderale P.M. - Orthop. Clin., Univ. Turin ITA - ITAL. J. ORTHOP. TRAUMATOL. 1977 3/3 (321-332)

The authors have reviewed cases of biomechanical failure of implants used in osteosynthesis over the last 10 years. The clinical, mechanical and metallurgic aspects connected with such failure are examined. Finally, proposals are made regarding both the clinical indications, and the design and construction of plates and nail plates. The main conclusion from this study is that plates break mainly due to fatigue when loaded before the fracture has united. The plate acts, from a mechanical point of view, as a temporary bypass of stress, but it can only function in this way for a limited period of time during which the fracture unites and takes over the stress. These stresses are greater in the lower limbs, and even more so in compression synthesis. Premature granting of load bearing, in all cases, can exceed the limit of metal fatigue. Breakages can also be accelerated by defects in construction, by damage during application or processing, and by material defect. Screw breakage is usually due to excessive stress being applied during application.

3449. A noncontacting electromagnetic device for the determination of in vivo properties of bone - Lakes R.S. and Saha S. - Dept. Engin. Appl. Sci., Yale Univ., New Haven, Conn. 06520 USA - MED. INSTRUM. 1978 12/2 (106-109)

A noncontacting, electromagnetic device to monitor stress waves in bone has been developed. Since bone exhibits piezoelectric-like behavior, a propagating stress wave in bone generates both electric and magnetic fields. The present device detects the magnetic field and thus provides a measure of the stress-wave amplitude in the bone. Excised dry and wet human femora, as well as a model system consisting of a bar of strongly piezoelectric ceramic, were examined using the device. Magnetic signals associated with elastic waves were also recorded in the long bones of human volunteers. Since the observed signals are not perturbed by the mechanical quality of the soft tissue over the bone, the device may be used to quantitatively assess the mechanical properties of bone in vivo.

3450. Distribution of forces acting on the hip joint under static conditions in positions removing the load from the lower extremity (Pols) - Lesiak A. and Zurowski R. - Zak. Rehab., Inst. Reumatol., Warszawa POL - REUMATOLOGIA 1978 16/3 (383-389) - summ in ENGL, RUSS

The authors tried to assess the value of exercises with removal of load from the joints used in treatment of patients with rheumatoid diseases. They assumed that during exercises of joints in positions thought to reduce the load on the joint surfaces forces develop pressing these surfaces together. Questions arose in this connection: how great are these forces and whether their action can damage the articular surfaces damaged already by the pathological process. The hip joint for the analysis of the distribution of forces within the joint, since the muscles acting on the hip joint are particularly big and powerful. Ten healthy subjects of either sex, at different ages, and with different values of

longitudinal body dimensions and body mass were selected for these investigations. The results of this analysis showed a close correlation between the value of the load placed on the hip joint and the body mass. The forces pressing together the articular surfaces were found to be negligible in the load-reducing positions commonly used during exercises by patients with rheumatoid arthritis. These investigations confirm the value of these positions in exercises of diseased joints.

3451. Longitudinal pulse propagation characteristics in striated muscle - Truong X.T., Jarrett S.R. and Rippel D.V. - Peoria Sch. Med., Univ. Illinois, Peoria, Ill. 61603 USA - J. ACOUST. SOC. AM. 1978 64/5 (1298-1302)

The real part of the complex Young's modulus of whole frog sartorius muscle in the resting state was derived from step pulse propagation data in the frequency range of 1.0-10,000 Hz. The derivation was based on Fourier integral analysis of the shapes of the propagated pulses to obtain velocities and attenuation coefficients for various harmonic frequencies. The results were consistent with previous sinusoidal wave propagation studies in the higher-frequency range. The general frequency response of the muscle was analogous to the 'standard linear solid' model. The relaxation time spectrum derived from the modulus-frequency function showed similar spectral contents to spectra obtained with other methods. The advantages and limitations of the pulse method are discussed.

3452. Evaluation of head injury from mechanical view point. II. Brain injury and intracranial hematoma (Japa) - Hirakawa K. - Dept. Neurosurg., Kyoto Pref. Univ. Med., Kyoto JPN - NEUROL. MED.-CHIR. 1978 18II/10 (701-711) - summ in ENGL

In the diagnosis of primary traumatic brain injury it is important to know the mechanical background of the injury. Clinical observations show that the natures and locations of brain injuries well correspond to the particular fashion and site of the blow. Although experimental observations show that the mass movement of the brain occur at the moment of the blow, theoretically brain injury occur by the combinations of translational and/or rotational acceleration where the skull is rigid and distortion injury where the skull is elastic. Thus, coup and contrecoup injury, gliding contusion, intermediate injury can be well comprehended and foreseen by applying the above mechanisms. Modifying factors are the irregularity of the skull base and the presence of the tentorium etc. The stochastic diagnosis of traumatic intracranial hematoma is a good example of a clinical application of mechanical analysis. There are many items in the table for stochastic diagnosis. But the most significant informations are the state and course of consciousness after the impact, the direction of the blow, and the side of neurological signs. Consciousness disturbance concerns the presence of the hematoma. The direction of the blow and the side of the neurological signs concern the type and the side of the hematoma. Only those three items can make the diagnosis 90% correct. To take notice of the mechanical action of the blow is important and is the first step to deepen the comprehension of head trauma.

3453. Tympanometrical studies in middle ear models (Germ) - TYMPANOMETRISCHE UNTERSUCHUNGEN AN MITTELOHRMODELLEN - Pau H.W. and Koch U. - Univ. Klin. HNO, D-5300 Bonn-Venusberg GFR - ARCH. OTO-RHINO-LARYNGOL. 1978 221/4 (261-267) - summ in ENGL

With very simple models it is demonstrated how changes in the middle ear system may influence the tympanometric curves. Changes in the middle ear pressure, the volume of the tympanon, the thickness of the tympanic membrane are simulated, effusions, retrotympanic scars, and adhesive processes. The corresponding changes in the tympanograms are shown.

3454. Graphic analysis of forces acting upon a simplified model of the foot - Veres G. - Nat. Coll. Prosthet., Sophies Mindes Orthop. Hosp., Oslo NOR - PROSTHET. ORTHOT. INT. 1977 1/3 (161-172)

Application of a graphical technique to analyse internal forces on a simplified model of the foot in various external loading patterns. The method is applied when the external load is acting purely upon the forefoot, the hindfoot and on both locations. The pes planus situation and the effect of the 'rocker' and inlay sole are studied.

3455. Work to fracture of canine femoral bone - Moyle D.D., Welborn J.W. III and Cooke F.W. - Div. Interdisciplin. Studies, Clemson Univ., Clemson, S.C. 29631 USA - J. BIOMECH. 1978 11/10-12 (435-440)

The work-to-fracture of canine femoral bone has been measured using the technique of Tattersall and Tappin (1966). The work required to fracture a specimen in three point bending by slow crack propagation through a triangular cross section is obtained from the load-deformation curve. The area of the resulting fracture surface is measured by macrophotographic techniques, and the work-to-fracture is calculated as work per unit area. The values of fracture 'toughness' measured in this way ranged from $5.36 \times 10^3 \text{ J/m}^2$ to $1.55 \times 10^4 \text{ J/m}^2$ in the samples tested with a mean of $9.03 \times 10^3 \text{ J/m}^2$ and a standard deviation of $3.27 \times 10^3 \text{ J/m}^2$. The work-to-fracture was found to vary with transverse variation in location in the femoral shaft. Scanning electron microscope photographs of the fracture surfaces indicate that the nature of the failure is similar to that of fiber reinforced composite materials. Samples which failed by catastrophic crack propagation were characterized by smooth fracture surfaces and had larger osteons than those which failed by slow crack propagation.

3456. A new definition of mechanical work done in human movement - Winter D.A. - Dept. Kinesiol., Univ. Waterloo, Ontario N2L 3G1 CAN - J. APPL. PHYSIOL. RESPIR. ENVIRON. EXERCISE PHYSIOL. 1979 46/1 (79-83)

The definition of efficiency of human movement has often been unable to cope with activities such as level gait because the numerator of the efficiency equation includes only external work done by the body on an external load. The major purpose of this paper is to propose a definition that not only accounts for any

external work but also for the internal work done by the limbs themselves. The internal work involves a new biomechanical analysis that takes into account all potential and kinetic energy components, all exchanges of energy within and between segments and both positive and negative work done by the muscles. This analysis was applied to a study of overground level gait on eight subjects walking at different walking speeds. The internal work/stride as calculated from the sum of segment energies was compared with the same calculation on the body's center of mass energy. The latter was found to be in error (low) by 16.2% and could be low by as much as 40%. The average internal work per body mass per distance walked was $1.09 \text{ J/kg} \times \text{m}$.

3457. Shear-induced activation of platelets - Ramstack J.M., Zuckerman L. and Mockros L.F. - Biomed. Engin. Cent., Northwest. Univ., Evanston, Ill. 60201 USA - J. BIOMECH. 1979 12/2 (113-125)

Platelet-rich plasma was subjected to shear in Poiseuille flows through tubes, i.d. = 305, 406 and 508 μm . Bulk-average shear stresses were 300, 750 and 1000 dynes/cm² and the average residence times were 25-1650 ms. These shears for these residence times did not produce cell lysis but did activate the platelets so that their response to exogenous ADP were reduced and platelet factor 3 was released. Also, thromboelastographic measurements indicated shear-induced hypercoagulability. Allowing samples to stand 30-60 mins after being sheared revealed some of the indicated activation was reversible. Adding the anticoagulant heparin to sheared samples produced an anomalous response. The quantitative results were independent of tube surface-volume ratio, but were dependent on both level of shear stress and on residence time.

3458. Comments on the lateral load capacity of the phalangeal joints (Germ) - UBER DIE SEITLICHE BELASTBARKEIT DER FINGERGELENKE - Dahmen G. and Dost G. - Orthop. Klin., Univ. Krankenh., Hamburg-Eppendorf GFR - Z. ORTHOP. IHRE GRENZGEB. 1979 117/1 (110-112) - summ in ENGL

The article compares the load capacity of the collateral ligaments of the metacarpo-phalangeal and interphalangeal joints exposed to a laterally applied force. The tests were performed in vivo with 50 each female and male volunteers. It was found that the average load capacity of the metacarpo-phalangeal and interphalangeal joints in women was 5.8 kp and in men 12.3 kp. Furthermore, the bones of the long fingers with the preserved joint capsules and collateral ligaments of ten corpses were also examined, and the collateral ligaments exposed to a load which was increased to the point of their destruction. The average values found in this manner were 26.5 kp for the metacarpo-phalangeal collateral ligaments and 15.4 kp for the interphalangeal collateral ligaments. This means that the pain threshold is usually below the destruction limit, so that generally there will be no spontaneous overloading. It is important for the construction of endoprostheses that their stability levels should always be above that of the pain

threshold and should attain at least the values of the tear tests, since otherwise these endoprostheses will not function properly. These basic prerequisites enable a comparative study of endoprostheses, the results of which will be presented at a later date.

3459. Methods, difficulties and inaccuracies in the study of human joint kinematics and pathokinematics by the instant axis concept. Example: the knee joint - Soudan K. and Van Audekercke R. - ICOTBI, Biomech. Biomaterials Sect., Univ. Louvain, B-3030 Heverlee BEL - J. BIOMECH. 1979 12/1 (27-33)

Describing the mechanics of human joints still remains a hard problem. In several studies the instant center has proved to be a valuable concept. Nevertheless the results from different investigations may vary. In this paper the most widespread used methods are evaluated. Furthermore the possible experimental defaults and inaccuracies and their influence on the instant center position are qualitatively explained starting from a theoretical footing. The instant center and instant axis are related to each other while the application field for each of them is outlined. As an illustration, the conclusions of this study are applied to the knee joint. The computation of the instant center for knee motion between 20 and 100° flexion from carefully checked experimental data yielded promising results.

3460. The response of living bone to controlled time-varying loading: Method and preliminary results - Churches A.E., Howlett C.R., Waldron K.J. and Ward G.W. - Univ. N.S.W., Sydney AUS - J. BIOMECH. 1979 12/1 (35-45)

This paper describes a method and equipment for applying controlled sinusoidally-varying axial compressive loading to a typical animal long bone - the ovine metacarpus. The loading is generated hydraulically and applied to the bone through stainless steel bone-pins surgically inserted in the metaphyses. For the ovine metacarpus, the mid-diaphyseal cross-section is well removed from the sites of surgical trauma and from the points of load application. Preliminary results show that the bones responded by adaptive remodelling in the mid-diaphyseal region. The maximum increase in cross-sectional area during a 28-day test period was approximately 17% when the nominal compressive stress was 8.8 MPa. Although a uniform stress field on the mid-diaphyseal region is theoretically possible, it has been found that significant stress non-uniformity may occur due to slight eccentricity of loading.

3461. Mechanical properties of the diaphragm and their application to a mathematical model - Pengelly L.D. - Dept. Med., McMaster Univ., Hamilton, Ontario CAN - AM. REV. RESPIR. DIS. 1979 119/2 (33-36)

The authors have used 3 models: (1) a simple piston-cylinder model, together with the data of Kim, to understand the mechanical properties of the diaphragm compartment; (2) a multicylinder model to examine the interrelationships of elastances in the ventilatory pump, and to relate the over-all elastance to the individual components; and (3) a simple electrical analogue, from which, given the properties described

previously, the authors can predict the effect of loading.

3462. Viscoelastic properties of copper deficient chick bone - Riggins R.S., Cartwright A.G. and Rucker R.B. - Dept. Orthop., Univ. California, Davis, Calif. USA - J. BIOMECH. 1979 12/3 (197-203)

Chickens fed copper deficient diets from birth produce a bone with increased collagen solubility. This, in turn, is related to the decrease in the cross-links in the collagen. The decreased cross-links in the collagen alter the mechanical properties of bone so that it exhibits an increase in its stress relaxation and a decrease in its tolerance to deformation. The above information was obtained by studying whole chick tibias subjected to stress relaxation experiments in torsion, followed by torsional tests to failure.

3463. Axial mechanical properties of arterial walls and their anisotropy - Sato M., Hayashi K., Niimi H. et al. - Inst. Basic Med. Sci., Univ. Tsukuba, Ibaraki JPN - MED. BIOL. ENG. COMPUT. 1979 17/2 (170-176)

The axial deformation behaviour of arterial walls and their anisotropy were studied experimentally using abdominal aortas, common carotid arteries and femoral arteries obtained from mongrel dogs. These tubular specimens were stretched in the axial direction keeping the internal pressure at various levels. Main results obtained were: the strain rate dependency of axial mechanical behaviour is not observed in the range of 3×10^{-3} to 3×10^{-1} per second; mechanical properties of arteries in the axial direction are dependent on the internal pressure applied; in the lower stress range, arterial walls are more extensible in the circumferential direction than in the axial direction, and an opposite trend occurs in the higher stress range; mechanical properties of arterial walls in the axial direction are expressed by the constitutive equations that we proposed in a previous paper.

3464. Effects of age on aortic pressure-diameter and elastic stiffness-stress relationships in unanesthetized sheep - Pagani M., Mirsky I., Baig H. et al. - Dept. Cardiol., Child. Hosp. Med. Cent., Boston, Mass. USA - CIRC. RES. 1979 44/3 (420-429)

The effects of aging and smooth muscle activation on the elastic stiffness of the aortic wall were assessed in nine unanesthetized adult sheep, seven newborn (<1 week) lambs, and five near term fetal lambs in utero, previously instrumented with pressure gauges and ultrasonic dimension crystals for measurements of internal pressure and external diameter in the proximal third of the descending thoracic aorta. Angiotensin and nitroglycerin were administered as intravenous (iv) boluses to increase or decrease pressure and diameter. The midwall stress (sigma)-radius data were fitted to an exponential curve ($r > 0.95$) for each animal. The curves obtained in this way were similar to those obtained by inflating and deflating an implanted hydraulic occluder. Incremental elastic modulus ($E(\text{inc})$) was derived as a linear function of stress. Compared at similar σ levels, $E(\text{inc})$ was significantly ($P < 0.05$) lower in the adults than in either the newborn or the fetuses. For example, at $\sigma = 3.30 \times 10^5$ dynes/cm², $E(\text{inc})$ was $1.41 \pm 0.10 \times 10^6$ dynes/cm² in

the adults, compared with 2.41 ± 0.35 in the lambs and 2.31 ± 0.15 in the fetuses. However, when $E(\text{inc})$ was calculated at the higher stress value corresponding to baseline mean arterial pressure, ($\sigma = 6.90 \pm 0.59 \times 10^5$ dynes/cm² in the adult, 3.36 ± 0.27 in the newborn, 3.62 ± 0.56 in the fetus), $E(\text{inc})$ was only slightly higher in the adults ($3.67 \pm 0.50 \times 10^6$ dynes/cm²) than in the newborns (2.42 ± 0.38) or the fetuses (2.58 ± 0.58). α -Adrenergic activation of aortic smooth muscle, induced by methoxamine infusion, shifted pressure-diameter and stress radius relationships toward higher pressure or stress for any given radius in the adult, whereas no alteration was observed in unanesthetized fetal or newborn lambs or in adults anesthetized with pentobarbital. Thus the aortic elastic modulus at any given wall stress is lower in the unanesthetized adult sheep than in the newborn or the fetus. However, the responsiveness of aortic smooth muscle to α -adrenergic stimulation increases with age.

3465. Bend propagation in flagella. II. Incorporation of Dynein cross bridge kinetics into the equations of motion - Hines M. and Blum J.J. - Dept. Physiol., Duke Univ. Med. Cent., Durham, N.C. 27710 USA - *BIOPHYS. J.* 1979 25/3 (421-441)

The cross-bridge formalism of T. Hill has been incorporated into the nonlinear differential equations describing planar flagellar motion in an external viscous medium. A stable numerical procedure for solution of these equations is presented. A self-consistent two-state diagram with curvature-dependent rate functions is sufficient to generate stable propagating waves with frequencies and amplitudes typical of sperm flagella. For a particular choice of attachment and detachment rate functions, reasonable variation of frequency and wave speed with increasing viscosity is also obtained. The method can easily be extended to study more realistic state diagrams.

3466. Effects of circum-oesophageal lesion on the behaviour of the stick insect *Carausius morosus*. I. Cyclic behaviour patterns - Graham D. - Zool. Dept., Univ. Glasgow GBR - *BIOL. CYBERN.* 1979 32/3 (139-145)

The isolation of the ventral nerve cord by circum-oesophageal nerve lesion produces a preparation which is capable of walking and righting itself when placed on its back. The body tonus is indistinguishable from that of an intact animal. However, the operation produces a two component behaviour pattern when the resting state is interrupted by a very light tactile stimulus. The animal then performs a series of twitching movements or momentary increases in tonus. This is followed by a brief walking episode of some 20-30 steps. The twitching and walking sequences as a successive pair may be repeated several times without further stimulation. These behavior patterns are examined as a function of time, temperature and external stimulation.

3467. Effects of circum-oesophageal lesion on the behaviour of the stick insect *Carausius morosus*. II. Changes in walking co-ordination - Graham D. - Zool. Dept., Univ. Glasgow GBR - *BIOL. CYBERN.* 1979

32/3 (147-152)

The co-ordination of the walking behaviour of decerebrate stick insects is examined and compared with normal behaviour. The walks are fully co-ordinated but undergo subtle changes in timing, have a longer average step period and show momentary pauses of 50 ms during the time course of protraction movements. In addition a new intersegmental reflex has been discovered. This tactile reflex is used to avoid errors in co-ordination that would be produced by posterior legs stepping onto the tarsi of the legs in front. The reflex has a latency of 100 ms and is easily observed in lesioned animals but is also active, although seldom seen, in slowly walking intact animals.

3468. The change in the load-sustaining ability and in the series elasticity in *Mytilus* smooth muscle during isotonic shortening - Sugi H. and Tsuchiya T. - Dept. Physiol., Sch. Med., Teikyo Univ., Tokyo JPN - *J. PHYSIOL. (LONDON)* 1979 VOL.288 (635-648)

The change in the ability to sustain a load and the change in the series elasticity in the anterior byssal retractor muscle (a.b.r.m.) of *Mytilus edulis* during isotonic shortening was studied by recording the length changes following step changes in load. When a load of 0.7-0.9 P(o) was applied after a period of isotonic shortening under a small load (0.05-0.1 P(o)), the muscle fibres showed continuous isotonic lengthening, indicating a reduction in the ability to sustain a load during isotonic shortening. Following the application of a load of 0.3-0.6 P(o) during isotonic shortening under a small load, the fibres exhibited a transient isotonic lengthening before starting to shorten isotonicly, indicating some degree of restoration in the load-sustaining ability after the step increase in load. No appreciable reduction in the load-sustaining ability was observed during isotonic shortening under a large load (more than 0.7 P(o)). The load-extension curves of the series elasticity determined during isotonic shortening were found to be scaled down roughly in proportion to the isotonic load. The stiffness of the muscle fibres during the isotonic shortening approached a certain finite value, when the isotonic load tended to zero. If the stiffness was measured during the development of isometric tension, the stiffness-isometric tension curve extrapolated towards the origin. High-speed cinematography during the step change in load indicated a fairly uniform distribution of the series elasticity along the length of the preparation. These results are discussed in relation to the sliding filament model of muscle contraction.

3469. Myelin swelling and measurement of forces between myelin membranes - Rand R.P., Fuller N.L. and Lis L.J. - Dept. Biol. Sci., Brock Univ., St Catharines, Ontario L2S 3A1 CAN - *NATURE (LONDON)* 1979 279/5710 (258-260)

Myelin has been observed by many workers to swell to a limited extent in water; a swelling thought to result from electrostatic repulsion between the myelin membranes. The extracellular space between membrane pairs increases by approximately 80 Å on immersion in water, whereas the intracellular space changes by only a few angstroms. On the other hand,

in phospholipid bilayer systems, very low surface charge densities (approximately 2 mol per cent charged phospholipid or 1 charge per 3,500 Å²) cause otherwise neutral phospholipid bilayers, which normally swell to a very limited extent, to separate indefinitely in water as result of electrostatic repulsion. At even lower surface charge densities, intermediate bilayer separations between that of neutral bilayers (about 27 Å) and charged bilayers (indefinite swelling) have rarely, if ever, been observed. Why, then, does nerve myelin swell to only a limited extent in water? We describe here our attempts to answer this question, and report that myelin is prevented from swelling indefinitely by mechanical forces. We have also succeeded in measuring the net repulsive force between myelin membrane pairs.

2.3. Heat and thermodynamics

3470. A hydrodynamic theory of ion conductance through ohmic pores - Eldridge C.A. and Morowitz H.J. - Dept. Molec. Biophys. Biochem., Yale Univ., New Haven, Conn. 06520 USA - J. THEOR. BIOL. 1978 73/3 (539-548)

A method of calculating the size of membrane pores lacking strong ionic selectivity is presented. By treating the flow of ions through a small channel as a hydrodynamic phenomenon, the electrical conductance becomes a function of the ratio of ion radius to channel radius. Thus when both the channel conductance and the ion size are known, the radius of the channel may be estimated. The method gives good agreement among radii predicted from conductances of four different alkali cations in alamethicin pores.

3471. A field and circuit thermodynamics for integrative physiology. II. Power and communicational spectroscopy in biology - Iberall A.S., Soodak H. and Hassler F. - Gen. Techn. Serv., Inc., Upper Darby, Pa. 19082 USA - AM. J. PHYSIOL. REGUL. INTEGR. COMP. PHYSIOL. 1978 3/1 (R3-R19)

This paper continues the development begun in Part I, to show in what way it is meaningful to reduce biological phenomena to physical theory at any level of organization. The appropriate level-independent physics is comprised of thermostatics, thermodynamics of irreversible processes, statistical mechanics, and nonlinear mechanics. Generalized, these approaches lead to a spectroscopic description of the constellation of periodic processes that constitute the living states. The spectroscopic description is here applied also to the inputs received by living systems, from lethal, high-energy, nuclear particles and radiation to low-energy communicational signals that make up languages understandable at the various levels in an hierarchical system. The concept of language is then itself generalized, showing how the empirical relation discovered by Zipf can be derived from a thermodynamic basis. It is demonstrated that certain linguistic and statistical-mechanical distribution functions can be related. Applications of the field thermodynamic approach to two problems in transport phenomena are given, as well as applications of field thermodynamics to language and communication.

3472. Correlation of electrical impedance and temperature in tissue during freezing - Gage A.A. - Dept. Surg., VA Hosp., Buffalo, N.Y. USA - CRYOBIOLOGY 1979 16/1 (56-62)

Experiments were performed correlating tissue temperature and tissue impedance in the course of freezing canine skin and palate. Tissue impedance rose gradually to high levels as the tissue froze. Tissue temperature of -26° to -30°C corresponded closely to tissue impedance of 1 MΩ. Tissue impedance of 5 to 10 MΩ corresponded closely to temperatures of -40°C and colder. These observations indicated that the measurement of tissue impedance was related to tissue temperature and suggested that either or both could be used to predict tissue destruction in cryosurgery.

2.4. Bioacoustics

3473. A new theory of cochlear function based on quasi quantum considerations - Tumarkin A. - Dept. ORL, Liverpool Univ., Liverpool GBR - BR. J. AUDIOL. 1978 12/4 (119-122)

A new theory of cochlear function is proposed. It locates the 2nd filter in the IHC which are regarded as biological resonators. The OHC play no part in frequency discrimination. Confirmation of the theory is derived from the fact that it offers plausible explanations for many otherwise unexplained paradoxes in the distribution of cochlear microphonics. It also explains why combination tones only occur in very restricted frequency regions, and it predicts their relative audibility. Finally a test is proposed whereby the theory must stand or fall.

3474. A mixed-source model for speech compression and synthesis - Makhoul J., Viswanathan R., Schwartz R. and Huggins A.W.F. - Bolt Beranek and Newman Inc., Cambridge, Mass. 02138 USA - J. ACOUST. SOC. AM. 1978 64/6 (1577-1581)

This paper presents an excitation source model for speech compression and synthesis that allows the degree of voicing to be varied continuously by mixing voiced (pulse) and unvoiced (noise) excitations in a frequency-selective manner. The mix is achieved by dividing the speech spectrum into two regions, with the pulse source exciting the low-frequency region and the noise source exciting the high-frequency region. The degree of voicing is specified by a parameter $F(c)$, which corresponds to the cut-off frequency between the voiced and unvoiced regions. For speech compression applications, $F(c)$ can be extracted automatically from the speech spectrum and transmitted. Experiments performed with the new model indicate its power in synthesizing natural sounding voiced fricatives and in largely eliminating the 'buzzy' quality of vocoded speech. A functional definition of buzziness and naturalness is given in terms of the model.

3475. The controversial relationship between loudness discomfort levels and acoustic reflex thresholds - Ritter R., Johnson R.M. and Northern J.L. - Brooke Army Med. Cent., San Antonio, Tex. 78234 USA - J. AM. AUD. SOC. 1979 4/4 (123-131)

Controversy presently exists concerning the relationship between loudness discomfort levels

(LDL's) and acoustic reflex thresholds (ART's). In this study, LDL's and ART's were obtained for two groups of ten normal-hearing adult subjects and one group of ten adult subjects with bilateral sensorineural hearing losses. The procedure involved obtaining LDL's and ART's under earphones and under sound field conditions for four different acoustic stimuli: pure tones, warble tones, spondaic words, and speech spectrum noise. One group of normal-hearing subjects and the hard-of-hearing group of subjects were given 'too loud, uncomfortably loud, or annoyingly loud' LDL instruction while a second group of normal hearing subjects were instructed to respond when a sound 'first starts to become uncomfortable'. Results indicated that LDL's, irregardless of instructional pattern, were reported at consistently higher sound pressure levels than the ART's, for all groups of subjects. The magnitude of the difference between the LDL's and ART's varied according to LDL instruction, type of test stimulus, hearing sensitivity of the subjects (normal hearing or hard-of-hearing) and transducer used for stimulus presentation. The results of this study demonstrate that ART's correlate too poorly with the LDL to permit ART's to be used as an objective measure of loudness discomfort.

3476. The middle ear inertial component of bone-conduction hearing in man - Humes L.E. - Div. Hearing Speech Sci., Vanderbilt Univ. Sch. Med., Nashville, Tenn. 37232 USA - **AUDIOLOGY (BASEL)** 1979 18/1 (24-35) - summ in **FREN**

The middle ear inertial component of bone-conduction hearing was studied in 8 normal-hearing young adults. The inertial component was eliminated to varying degrees by introducing various positive and negative air pressures into the ear canal. Sweep-frequency Bekezy tracings were obtained from 100 through 5000 Hz for bone-conducted pure tone stimuli while the air pressure of the test ear was varied and the nontest ear was masked. Air pressures of ± 100 , ± 300 , and ± 500 mm H₂O were utilized. Results revealed maximal shift in the mid frequencies (750 Hz) and an increase in effect with increase in pressure. A second prominent region of threshold shift emerged at 2000 Hz for the ± 500 mm H₂O air pressure conditions. Considerable variability in the magnitude of threshold shift and in the frequency region of maximum shift was observed.

3477. Suggested threshold sound pressure levels for frequency-modulated (warble) tones in the sound field - Morgan D.E., Dirks D.D. and Bower D.R. - UCLA Med. Sch., Cent. Hlth Sci., Los Angeles, Calif. 90024 USA - **J. SPEECH HEAR. DISORD.** 1979 44/1 (37-54)

The problems inherent in using frequency-specific stimuli in the sound field to determine the threshold sensitivity are reviewed, including a discussion of some of the specific problems encountered when introducing pure tones, narrow bands of noise, and frequency-modulated (FM) tones. The results of two experiments are reported. In experiment I, the relationship between pure tones and frequency-modulated tones is developed under earphones in an anechoic chamber, and in two sound-isolated auditory test rooms (not

anechoic). Experiment I resulted in the development of a reference threshold sound pressure level for frequency-modulated signals in the sound field. In experiment II the reference level was applied to a clinical test facility and evaluated with a group of hearing-impaired individuals. The results suggest that the sound-field reference levels accurately reflect monaural threshold under earphones, when the earphone is calibrated to the ANSI, 1969 standard, and the sound field is calibrated to the suggested standard.

2.5. Biooptics

3478. The mathematical theory of lateral impedance of visual activity and an application of Markov processes - Berman S.M. and Stewart A.L. - Courant Inst. Mathemat. Sci., New York Univ., New York, N.Y. USA - **BIOL. CYBERN.** 1978 30/2 (99-108)

The mathematical relationship describing recurrent lateral inhibition is expressed as a linear operator equation. Under quite general conditions, the operator equation is shown to have a unique non-negative solution. It is also shown that the linear operator for recurrent impedance is representable as an integral operator and that, when in application to physiological models it is interpreted as recurrent inhibition, the corresponding linear equation assumes a form more general than the well known Hartline-Ratliff equation. Finally, the authors introduce a class of impedance operators based on the probabilistic theory of Markov processes, solve the corresponding linear integral equation, and apply the theoretical properties of the solution to the analysis of physiological and psychophysical phenomena.

3479. On the correlation model: Performance of a movement detecting neural element in the fly visual system - Zaagman W.H., Mastebroek H.A.K. and Kuiper J.W. - Lab. Gen. Phys., Dept. Biophys., Univ. Groningen 9718 CM NLD - **BIOL. CYBERN.** 1978 31/3 (163-168)

The applicability of the basic principles of the correlation model to the description of the activity of a movement detecting neuron in the third optic ganglion of the fly's visual system has been investigated. This wide field neuron is supposed to sum the outputs of a large number of correlators (i.e. multiplying units followed by time averagers) that are distributed over almost the entire eye. The model describes and predicts the experimental results in a satisfactory way if a uniformly distributed system of correlators is assumed. The sampling base of the correlators in this system equals the intercommatidial angle $\Delta\phi_i$. The half width of the spatial sensitivity distribution of the visual inputs of the correlators, $\Delta\rho$, is equal to the half width of the retinula cells of the 1-6 system.

3480. A comparison of threshold and suprathreshold appearance of gratings with components in the low and high spatial frequency range - Campbell F.W., Howell E.R. and Johnstone J.R. - Physiol. Lab., Univ. Cambridge CB2 3EG GBR - **J. PHYSIOL. (LONDON)** 1978 VOL. 284 (193-201)

The appearance of square gratings with some of their Fourier components missing has been investigated for

both threshold and suprathreshold contrasts. If high frequency components are removed from a square grating there is only a very small effect on the detection threshold, or suprathreshold appearance, unless the components are visible by themselves. If the fundamental frequency is removed from a square-wave grating which has a spatial frequency lower than 1 cycle per degree (c/d) the contrast sensitivity is not altered. This is generalisation of the Craik-Cornsweet illusion. If the contrast is raised above the detection threshold the grating is indistinguishable from a square grating, unless the contrast is high enough to see the fundamental when it is presented alone. If the fundamental is removed from a square grating which has a spatial frequency higher than 1 c/d the contrast threshold and the appearance at all contrasts are changed. At threshold it appears as a sinusoidal grating of three times the fundamental frequency. The threshold is dictated solely by the amplitude of the third harmonic. If the contrast is further raised, so that the fifth harmonic also reaches threshold, the periodicity of the fundamental is seen. Therefore, gratings of many different luminance profiles (including the Craik-Cornsweet profile) all produce the perception of a square grating simply because those missing components which would be required in each case to produce a perfect square are by themselves undetectable. The visual system responds as though hardwired to detect square gratings and edges by means of quasi-Fourier analysis. These results are analogous to the missing fundamental, or residue, effect in hearing.

3481. Perceived stimulus difference in the honeybee: Contribution of individual parameters (Germ) - Ronacher B. - Inst. Biol. III, Univ. Freiburg i. Br. GFR - BIOL. CYBERN. 1979 32/2 (77-83) - summ in ENGL

The perceptual difference between stimuli can be regarded as distance within the perceptual space of the bee. The author used this assumption to determine the specific distance function, on the basis of which the differences in the individual perceptual parameters constituted the perceptual difference between the complex stimulus and the reference stimulus. The perceptual differences can be deduced only indirectly from the choice frequency. Consequently, it was necessary to establish a 'calibration curve', to deduce quantitatively the perceptual difference from the choice frequency. The resulting hyperbolic curves for the parameters 'brightness' and 'size' were almost identical. The perceptual difference between the complex stimulus and the reference stimulus is greater than one would expect in a Euclidean space. Rather it is the sum of the distances along the perceptual parameters which compose the complex stimulus. Thus, the bee determines the perceived difference of composite stimuli which affect the perceptual parameters 'brightness' and 'size' in terms of the city-block metric.

3482. Model of the analyser of the intensity of light - Vaitkevicius H.H. and Sokolov Ye.N. - Phys. Dept., State Univ., Vilnius SUN - BIOPHYSICS 1978 23/3 (527-532)

A model of the analyser of the intensity of the light stimulus is proposed coding this parameter by the number of the output element. The individual elements of the model possess a reaction similar to the reaction to light of the corresponding neurones of the visual analyser B and D neurones, detectors of intensity and 'brightness' cells. As a whole the 'perception by the model of the intensity' is governed by the Stevens law and the Weber-Fechner law.

3483. Optical measurements on scattering media for biomedical applications - Pollak V. - Electr. Engin. Dept., Univ. Saskatchewan, Saskatoon S7N 0W0 CAN - MED. BIOL. ENG. COMPUT. 1979 17/2 (230-238)

The topics of this paper are some theoretical questions relating to the use of photometric measurements on turbid media, for determining the concentration of mostly selectively absorbing substances diffusely contained in the latter. Emphasis is placed on aspects relevant to common biomedical applications. The starting point is the well known theory of Kubelka and Munk. Its equations are used in modified form, derived from a previously developed electrical model of the optical case. It is shown that the wanted concentration values are obtained by inverting the difference (or the ratio) of the optical response signals of the examined sample and of the blank medium. The relative advantages of measurements in the transmittance and reflectance models are briefly discussed. For practical purposes, a linearised form of the inverted solutions of the Kubelka and Munk theory is highly desirable. A very close linear approximation can be obtained by applying a logarithmic transform for transmittance and a reciprocal expression for reflectance. In both cases the transformed response signal represents a linear function of absorption over a wide range of values. Computer calculated tables and graphs are provided, which give the slope and intercept constants involved for different magnitudes of scatter. The linearisation, which was originally derived only for situations, where the presence of the investigated material does not affect the scattering power of the sample, is then extended also to the case, where absorption and scatter change jointly.

3484. Light scattering of normal human lens I. Application of random density and orientation fluctuation theory - Bettelheim F.A. and Paunovic M. - Chem. Dept., Adelphi Univ., Garden City, N.Y. 11530 USA - BIOPHYS. J. 1979 26/1 (85-99)

Light-scattering intensities in the $I(//)$ and I_{\perp} mode were obtained on thin sections of three human lenses. Random density and orientation fluctuation theory, without cross correlation, was employed to evaluate light-scattering parameters. Both the density correlation distances, as well as the orientation correlation distances, were related to structural elements in the lens fiber cell that have been observed by other investigators with different techniques. The magnitude of these fluctuations were evaluated, and it was demonstrated that the density fluctuations are the main contributors to light scattering in normal human lenses. Changes in the light-scattering parameters were evaluated as a function of position within the lens. The

changes observed agree with the biochemical data in the literature that reflects that an aging process occurs when one proceeds from the periphery of the lens toward the center.

2.6. Gas physics

3485. Modelling the respiratory airflow pattern by optimization criteria - Hamalainen R.P. and Viljanen A.A. - Systems Theory Lab., Helsinki Univ. Technol., Helsinki FIN - BIOL. CYBERN. 1978 29/3 (143-149)

A model of the control of the respiratory cycle pattern is presented in which the airflow shape is determined by a dynamic optimization problem. The inspiratory and expiratory phases have different performance criteria both of which are related to the oxygen cost of breathing, and to the minimization of tissue damage and control difficulties. The model successfully predicts various patterns of spontaneous breathing during both inspiration and expiration. The effects of applying elastic and resistive loads to the respiratory system can also be predicted. The model performance is in good agreement with the experimental observation that increasing resistance makes the airflow patterns more rectangular.

3486. The alveolar air equation abbreviated - Raymond L.W. - Dept. Med., Univ. California, San Francisco, Calif. USA - CHEST 1978 74/6 (675-676)

The alveolar air equation is not widely used in clinical medicine, probably because of the complicated appearance of its classic forms. The following shorter form has been derived: $PAO_2 = [PEO_2 - PIO_2 (VD/VT)]/[1 - VD/VT]$ (where PAO_2 , PEO_2 , and PIO_2 are the partial pressures of oxygen in alveolar, expired, and inspired gas, respectively, and VD/VT is the ratio of physiologic dead space over tidal volume). This shorter form is an algebraic identity of the classic equation. The shorter form involves the same assumptions and requires the same measurements as the traditional expressions but is more compact and easier to use in circumstances where VD/VT is measured routinely.

3487. Corrections to the Hazelhoff model of airflow in the avian lung - Brackenbury J. - Dept. Biol., Univ. Salford M5 4WT GBR - RESPIR. PHYSIOL. 1979 36/2 (143-154)

The ventilatory activity of the anterior and posterior groups of air sacs was simulated in unidirectionally-ventilated geese and the resultant flow of air in the mediobasal secondary bronchi was used as an indicator of the route which air followed through the lung. The results were used to isolate the roles of the respective groups of air sacs in the shaping of the unidirectional pattern of airflow known to exist during normal respiration. Findings indicated that, in contrast to Hazelhoff's model, the anterior and not the posterior sacs are responsible for producing the caudo-cranial flow of air through the parabronchi during inspiration. The posterior sacs, as predicted by Hazelhoff's model, are primarily responsible for driving the caudo-cranial current through the parabronchi during expiration.

3488. Inert gas a-A differences: A direct reflection of V/Q distribution - Neufeld G.R., Williams J.J., Klineberg P.L. and Marshall B.E. - Dept. Anesthesia, Univ. Pennsylvania Sch. Med., Philadelphia, Pa. 19104 USA - J. APPL. PHYSIOL. RESPIR. ENVIRON. EXERCISE PHYSIOL. 1978 44/2 (277-283)

A computer model was developed to study the relationship between ventilation-to-perfusion (V/Q) mismatch and the development of inert gas arterial-to-alveolar partial pressure differences (a-A differences). Increasing inhomogeneity of V/Q ratio is revealed directly as an increase in the a-A difference of each gas. The quantitative relationships between the Q vs. V/Q distribution and the fractional a-A difference solubility plot (a-A difference plot) were studied and described. These studies demonstrated that for log normally distributed V/Q ratios, the area under the a-A difference plot is linearly related to the log variance of the V/Q distribution and can be estimated directly from the values obtained from six gases. The maximum a-A difference occurs for a gas whose solubility is numerically equal to the mean V/Q. The effects of departure from log normality and multimodality are discussed. We concluded from these studies that quantitative information regarding the degree of inhomogeneity of V/Q for log normal distribution is available from direct calculations of inert gas retention and excretion data. Qualitative information is also available indicating the departure from log normality and the region toward which the distribution is skewed.

3489. Computation of the average in- and expiratory airway resistance (Germ) - BERECHNUNG DES MITTLEREN IN- UND EXPIRATORISCHEN BRONCHIALEN STROMUNGSWIDERSTANDES - Wiessmann K.J. and Steinijans V.W. - Abt. Innere Med., Med. Hochsch., Lubeck GFR - RESPIRATION 1979 37/1 (15-22) - summ in ENGL

This paper extends the mathematical model of Jaeger and Otis to a separate computation of the mean airway resistance in the in- and expiratory phase. The extended method is illustrated and compared to known methods by means of data on 12 healthy subjects and 12 patients with obstructive airway diseases.

2.7. Fluid flow systems

3490. On steady flow through modelled vascular stenoses - MacDonald D.A. - Dept. Appl. Mathemat. Theoretic. Phys., Univ. Liverpool L69 3BX GBR - J. BIOMECH. 1979 12/1 (13-20)

A technique for the solution of the approximate equations governing steady flow through models of mild axisymmetric arterial stenoses is presented. Solutions obtained for flow through stenoses which have been the subject of experimental and numerical investigation indicate that the approximate equations can in practice be valid for stenoses which would normally be described as severe; this feature is of some practical value since the approximate equations require the specification of a velocity profile at one axial station only.

3491. Nonsymmetrical bifurcations in arterial branching

- Zamir M. - Dept. Appl. Mathemat. Biophys., Univ. West. Ontario, London, Ontario N6A 5B9 CAN - J. GEN. PHYSIOL. 1978 72/6 (837-845)

The results of optimality studies of the branching angles of arterial bifurcations are extended to nonsymmetrical bifurcations. Predicted nonsymmetrical bifurcations are found to be not unlike those observed in the cardiovascular system.

3492. Analogue computer model of a kidney during preservation - Flax S.W., Webster J.G., Updike S.J. and Uehling D.T. - Dept. Electr. Computer Engin., Univ. Wisconsin, Madison, Wis. 53706 USA - MED. BIOL. ENG. COMPUT. 1979 17/2 (199-206)

This report describes a model of the renal perfusion dynamic changes that occur during kidney preservation. The model utilises data from physiological experiments performed in this laboratory as well as from observations reported in the literature. Included in the model are the effects of cellular volume changes due to metabolic variations, vascular distensibility and a hypothesised tissue pressure effect observed under some conditions.

3493. Identification of a fluorescein tracer model for determination of the flow rate of aqueous humor in the eye - Koivo A.J. and Stjernschantz J. - Sch. Electr. Engin., Purdue Univ., West Lafayette, Ind. 47907 USA - COMPUT. BIOL. MED. 1979 9/1 (1-9)

The continuous flow of the aqueous humor through the posterior and anterior chambers in the eye into Schlemm's canal is vital for the maintenance of a constant intraocular pressure. If the intraocular pressure rises above the normal range, several problems start appearing insidiously; for example, gradual visual field defects develop, leading ultimately to glaucoma. The determination of the flow rate of the aqueous humor is here performed by identifying a mathematical model after the free fluorescein concentration in the blood and in the anterior chamber of the eye has been measured. Experimental data obtained on rabbits are used in the analysis, and the flow rate of the aqueous humor in rabbit eyes is computed. This study demonstrates the feasibility of the approach in a clinical environment.

2.8. Electrical systems

3494. Evidence for a discrete charge effect within lipid bilayer membranes - Wang C.C. and Bruner L.J. - Dept. Phys., Univ. California, Riverside, Calif. 92521 USA - BIOPHYS. J. 1978 24/3 (749-764)

A high amplitude voltage step technique has been used to measure the surface density of dipicrylamine anions adsorbed at the surfaces of lipid bilayer membranes. Accompanying low amplitude measurements have determined the relaxation time for transient current flow across the membranes, a parameter governed by the height of the central energy barrier which dipicrylamine anions must cross in moving from one membrane surface to the other. Measured relaxation times and surface charge densities have been related by a quasi-continuum model of the discrete charge effect, which predicts that the membrane central barrier height will increase with

increasing density of adsorbed surface charge. The experimentally determined relationship is in satisfactory agreement with the predictions of the model. The model does not provide a complete description of the membrane/solution interface, however, because it cannot be applied to the description of previously measured isotherms for the adsorption of dipicrylamine anions onto bilayer membrane surfaces. Possible reasons for this discrepancy are discussed.

3495. Piece-Wise Fourier-analysis of images and the role of occipital, temporal, and parietal cortex in visual perception (Russ) - Glezer V.D. - Pavlov's Inst. Physiol., Acad. Sci. USSR, Leningrad SUN - FIZIOL. ZH. SSSR IM. I. M. SECHENOVA 1978 64/12 (1719-1730) - summ in ENGL

On the basis of previously published data, a neuronal scheme of organization of the visual perceptions in the cerebral cortex is suggested. An idea of neuronal module is introduced: a cylinder of cortical neurons whose receptive fields are directed towards the same area of the visual field and respond to different spatial frequencies and orientations. A system of overlapping modules is able of piece-wise Fourier-description of portions of the image. The modules of the Clare-Bishop area are composed of receptive fields of different size. Owing to that each neuron of the module projects inhibitory influence upon other neurons, the module acts as a filter picking out the texture. Therefore, the modules of the Clare-Bishop area single out and supply Fourier-description of subimages, the latter being characterized by the same local spectrum within their own limits. The lower portion of temporal cortex performs a rough identification of subimages and images with the aid of systems of learning neurons. The parietal cortex conforms the description from temporal cortex to the complete description in the modules of occipital cortex, thus performing the transition from an image to a concrete picture.

3496. Development of ocularity domains and growth behaviour of axon terminals - Von Der Malsburg Ch. - Max-Planck-Inst. Biophysikal. Chem., Abt. Neurobiol., Gottingen GFR - BIOL. CYBERN. 1979 32/1 (49-62)

Ontogenetic development of ocularity domains-strips, patches and layers in cortex, colliculus superior and lateral geniculate nucleus-is the result of organization that may either be intrinsic to the postsynaptic structure or induced to it by the afferents. A specific type of axonal growth behavior that was recently proposed as a basis for ontogenetic development of retinotopy is sufficient to account also for ocularity domains. No intrinsic organization in the postsynaptic structure is required. The latter merely serves as a propagating medium for markers carried by the presynaptic terminals. Computer simulations demonstrate the mechanism to be complete and consistent.

3497. Properties of the vagal excitation transfer to the rabbit atrium (Germ) - EIGENSCHAFTEN DER VAGALEN ERREGUNGSUBERTRAGUNG AUF

DAS VORHOFMYOKARD - Nilius B. - Physiol. Inst., Martin-Luther-Univ., Halle-Wittenberg, 402 Halle DDR - ACTA BIOL. MED. GER. 1978 37/3 (453-462) - summ in ENGL

A mathematical model of pre- and postganglionic parasympathetic nerve after excitation transfer is developed. This model gives a measure Q of acetylcholine (ACh) release from presynaptic preganglionic boutons and postganglionic varicosities. When increasing Ca^{++} the measure Q increases too. Na^+ ions exert a competitive inhibition. The relationship between Q and the Ca/Na^2 -quotient is a hyperbolic one. Mn^{++} inhibits the release of ACh non-competitively. Q increases both by excess potassium and Cs^+ depolarization. The ACh release is diminished by Mg^{++} cannot replace the effect of Ca^{++} on ACh release in Ca^{++} depleting conditions. Q increases with decreasing pH-level. The ACh release is not significantly influenced by increasing pH, Verapamil (4 m/l) prostaglandins E_2 and $F_2\alpha$ (20 ng/ml) and substitution of nonpermeable anions for Cl^- .

3498. Electric potential in cylindrical syncytia and muscle fibers - Peskoff A. - Dept. Physiol., Sch. Med., UCLA, Los Angeles, Calif. 90024 USA - BULL. MATH. BIOL. 1979 41/2 (183-192)

The model developed in an earlier paper using two coupled partial differential equations for calculating the intracellular and extracellular electric potentials in a syncytium is applied here to cylindrical geometry. Eigenfunction expansions are obtained for the potentials resulting from an intracellular point source of current. The required orthogonality relations for the two sets of coupled radial eigenfunctions are derived. The model is applied to the structure composed of the interior and the transverse tubules of a muscle fiber. Asymptotic structure composed of the interior and the transverse tubules of a muscle fiber. Asymptotic expansions for ζ and $\beta \rightarrow 0$ are obtained, where ζ is the product of the effective intracellular resistivity, the fiber radius and the outer surface membrane admittance per unit area, and β is the ratio of the effective intracellular resistivity to that of the tubular lumen. Earlier results from the distributed circuit model of a muscle fiber are recovered when ζ and β are small, and for a nerve axon when $\beta = 0$.

3499. Apparatus for the rapid measurement of electrocardiographic body surface potentials - Kilpatrick D., Duffin P., Vickery J.C. and Bourdillon P.J. - Div. Cardiovasc. Dis., Roy. Postgrad. Med. Sch., London GBR - MED. BIOL. ENG. COMPUT. 1979 17/2 (257-260)

A method for the rapid and reproducible recording of 24 chest electrode potentials is described. Rigid electrodes are equally spaced around the thorax in three rows of eight. The electrodes move radially and are spring loaded so as to maintain contact with the skin regardless of the shape of the subject's torso. The inclusion of an impedance converter in the electrode assembly removes the necessity for using electrode cream. Although equal spacing of the electrodes around the thorax is inefficient in terms of information content per electrode the attention to detail required

for electrode placement using the described system is minimised as compared with other multiple lead systems. Furthermore, the principles adopted in the design and construction of the apparatus do not limit the number of chest electrodes to 24.

3500. Synaptic transmission in a model for stochastic neural activity - Tuckwell H.C. - Dept. Mathemat., Univ. British Columbia, Vancouver CAN - J. THEOR. BIOL. 1979 77/1 (65-81)

A stochastic model equation for nerve membrane depolarization is derived which incorporates properties of synaptic transmission with a Rall-Eccles circuit for a trigger zone. If input processes are Poisson the depolarization is a Markov process for which equations for the moments of the interspike interval can be written down. An analytic results for the mean interval is obtained in a special case. The effect of the excitatory reversal potential is considerable if it is not too far from threshold and if the interspike interval is long. Computer simulations were performed when inhibitory and excitatory inputs are active. A substantial amount of inhibition leads to an exceedingly long tail in the density of the interspike time. With excitation only the interspike interval is often an approximately lognormal random variable. A coefficient of variation greater than one is often a consequence of relatively strong inhibition. Inferences can be made on the nature of the synaptic input from the statistics and density of the time between spikes. The inhibitory reversal potential usually has a relatively small effect except when the frequency of inhibition is large. An appendix contains the model equations in the case of an arbitrary distribution of postsynaptic potential amplitudes.

3501. The gastrointestinal absorption of plutonium and americium in the hamster - Stather J.W., Harrison J.D., Rodwell P. and David A.J. - Nat. Radiol. Protect. Board, Harwell, Didcot OX11 0RQ GBR - PHYS. MED. BIOL. 1979 24/2 (396-407) - summ in GERM, FREN

Plutonium 239 and americium 241 were administered to adult hamsters in various chemical forms and their absorption from the gut was measured. The results have been compared with published data on other species in order to derive values for the estimated absorption of these actinides in man. On the basis of current knowledge, the best values for adults would appear to be: 0.05% for americium, 0.01% for plutonium ingested in soluble form, and 0.0001% for plutonium ingested as the dioxide. Plutonium dioxide should be considered as soluble if a significant proportion (>5%) of the activity is in particles less than 25 nm in diameter.

3502. The interpretation of membrane current-voltage relations: A Nernst-Planck analysis - Attwell D. and Jack J. - Univ. Lab. Physiol., Oxford GBR - PROG. BIOPHYS. MOL. BIOL. 1978 34/2 (81-107)

In this paper we will state limitations on the membrane current-voltage relations that a simple Nernst Planck (NP) treatment implies, give criteria that can exclude certain experimental data from being described by such an approach, and show that if a

membrane I-V relation is consistent with the NP equation, then if the experimental data is accurate enough, the I-V relation can in principle be used to obtain the potential energy that an ion experiences, as a function of position in the membrane. The use of the Goldman, Hodgkin, Katz equation to describe the relative permeability of a membrane to different ions is then criticized, and experimental data on giant axons and the myelinated node are assessed in terms of the NP approach.

3503. The effects of filtering the His-Purkinje system electrocardiogram - Berbari E.J., Lazzara R. and Scherlag B.J. - Sect. Cardiol., VA Hosp., Miami, Fla. 33124 USA - IEEE TRANS. BIO-MED. ENG. 1979 26/2 (82-85)

Several laboratories have used signal averaging to record His-Purkinje system (HPS) potentials from the body surface of man as a means of noninvasive evaluation of intraventricular conduction. This study evaluated the use of a 0.3-300 Hz recording bandwidth as opposed to a bandwidth of 80-300 Hz most commonly used by other investigators. The wider bandwidth produced HPS recordings which were quite reproducible among eight normal subjects and showed marked changes in duration and configuration among twelve subjects with right or left bundle branch block. Comparisons were then made between analog filtered HPS waveforms and a digital differentiation algorithm. An explanation of the high frequency components of the HPS waveform is based on known properties of the HPS. This will aid in the development of models for implementing a forward or inverse solution for HPS potentials.

3504. Effect of random frequency modulation on ECG power spectra - Richardson J.M., Murthy V.K. and Haywood L.J. - Univ. South. California Med. Cent., Los Angeles, Calif. 90033 USA - IEEE TRANS. BIO-MED. ENG. 1979 26/2 (109-112)

Electrocardiographic signals are an example of biological signals whose fundamental characteristics may be altered by environmental factors. Frequency modulation due to the influence of respiration and other factors may alter the signals and affect the characteristic power spectrum. Here the effects of random frequency modulation on ECG power spectra are examined in two cases: when there is random phase modulation in the periodic Fourier series model and when the consecutive cycles for a given sequence of beats deviate from periodicity due to random variation in the fundamental frequency about its mean. It is concluded that the differential effects of random frequency modulation on the power spectrum can be detected and its contribution defined. Thus, the underlying power spectrum of identical signals with and without random phase and frequency modulations can be defined.

3505. Voltage clamping of multicellular myocardial preparations: Capabilities and limitations of existing methods - Beeler G.W. and McGuigan J.A.S. - Sect. Informat. Processing Syst., Mayo Clin., Rochester, Minn. 55901 USA - PROG. BIOPHYS. MOL. BIOL. 1978 34/3 (219-254)

It is now 8 years since the 1971 article by Johnson and Lieberman in which they heavily criticized the methods of voltage clamping as applied to cardiac tissue. While the language of the review was unfortunate, the paper did focus attention on the methodology and the possible limitations of the method. This article is not a review, but rather an attempt to describe what is possible, what is not possible and how much reliability can be attached to results obtained with the method. The article is divided into five parts. Part I consists of a description of methodology. Part II discusses problems with the methodology, voltage control (both longitudinally and radially), series resistance, interface problems between Tyrode and sucrose, and measurement difficulties. In Part III, the various computer simulations are considered and Part IV deals with the various artefacts that can arise, including artefacts of interpretation. Finally, in Part V, methods are suggested for checking the validity and adequacy of the clamp and of assessing the adequacy of the interpretation of the results. The article is confined to a consideration of cardiac tissue other than Purkinje fibres. Purkinje fibres or other excitable tissues will only be referred to when it is felt that such work has direct relevance to the article.

3506. Admittance change of squid axon during action potentials. Change in capacitive component due to sodium currents - Takashima S. - Dept. Bioengin., Univ. Pennsylvania, Philadelphia, Pa. 19104 USA - BIOPHYS. J. 1979 26/1 (133-142)

Since the discovery of Cole and Curtis that the imaginary components, i.e., capacitive and inductive components, of the admittance of squid axon membrane remained unchanged during the action potential, there have been numerous studies on impedance and admittance characteristics of nerves. First of all, it is now known that the dielectric capacitance of the membrane is frequency dependent. Second, the recent observation of gating currents indicates that dipolar molecules may be involved in the onset of ionic currents. Under these circumstances, the author felt it necessary to reinvestigate the membrane admittance characteristics of nerve axons. The measurements by Cole and Curtis were performed mainly at 20 kHz, indicating that their observation was limited only to the passive membrane capacitance. To detect the change in the capacitive component during the action potential, we performed transient admittance measurements at lower frequencies. However, the frequency range of the measurements was restricted because of the short duration of the normal action potential. In addition, a change in the inductive component obscured the low frequency behavior of the capacitance. To use a wider frequency range and simplify the system by eliminating the inductive component, the potassium current was blocked by tetraethyl ammonium, and the increase in the capacitive component was reinvestigated during the long action potential. The admittance change under this condition was found to be mostly capacitive, and conductance change was very small. The increase in the capacitive component was from 1.0 to 1.23 $\mu\text{F}/\text{cm}^2$.

2.9. Nuclear biophysics

3507. The biological solubility in the rat of plutonium present in mixed plutonium-sodium aerosols - Stradling G.N., Loveless B.W., Ham G.J. and Smith H. - Nat. Radiol. Protect. Board, Harwell, Didcot, Oxon, OX11 0RQ GBR - HEALTH PHYS. 1978 35/2 (229-235)

The amount of plutonium transported from the lungs to blood following the intubation of mixed oxide suspensions obtained from a polydisperse aerosol depends primarily on the presence of plutonium dioxide (PuO_2) particles of about $0.001\text{-}\mu\text{m}$ diameter. These particles under certain conditions may represent up to 50% of the total plutonium. The extra-pulmonary tissue distribution of plutonium is similar to that obtained for soluble plutonium citrate. The enhanced excretion of plutonium in the early phase following the administration of the $0.001\text{-}\mu\text{m}$ diameter particles is due in part to a low molecular weight species identified in blood and which is capable of filtration by the kidneys. The observations reported here indicate that the Task Group Lung Model is not applicable to aerosols containing $0.001\text{-}\mu\text{m}$ diameter particles if these are present in significant quantity. Furthermore, the use of an empirical fixed factor to determine systemic burden from urine analysis data is not valid.

3508. Methods for the assay of plutonium in vivo: What are the alternatives? - Rundo J., Strauss M.G., Sherman I.S. and Brenner R. - Argonne Nat. Lab., Argonne, Ill. 60439 USA - HEALTH PHYS. 1978 35/6 (851-858)

The problem of estimating the amount of plutonium in the human body in vivo is of considerable importance in view of the major role plutonium may play in the future nuclear power program. It is a particularly difficult one because the plutonium isotopes present in reactor-grade material emit virtually no penetrating radiation, so that conventional methods of body radioactivity measurement are useless. In this note, the authors review briefly the existing methods and suggest some practicable, but not necessarily very practical alternatives. Emphasis is placed on plutonium in the lung, the major problem, but reference is made to systemically deposited plutonium. The discussion is divided into two major categories, indirect and direct methods.

3509. ^{90}Sr and ^{137}Cs in coyote scats from the Hanford Reservation - Springer J.T. - Dept. Zool., Washington State Univ., Pullman, Wash. 99164 USA - HEALTH PHYS. 1979 36/1 (31-33)

Sixty scats (feces) from coyotes (*Canis latrans*) were collected during the spring of 1976 from these locations on the U.S. DOE Hanford Reservation in southcentral Washington. Only 5 of the 60 scats had detectable ^{137}Cs activity levels. All scats had measurable ^{90}Sr activity levels. Scats collected close to nuclear waste burial sites had the highest levels of radioactivity, and scats collected the greatest distance from the waste burial sites had the lowest levels. Coyotes are potential dispersers of radioactivity, and the data presented here suggest that surveillance of coyote scats can be a useful adjunct to radiobiological monitoring procedures.

3510. ^{222}Rn daughter dosimetry in the Syrian golden hamster lung - Desrosiers A., Kennedy A. and Little J.B. - Yankee Atom. Electric Co., Westboro, Mass. 01581 USA - HEALTH PHYS. 1978 35/5 (607-623)

A detailed morphometric description of the dimensions of airways, the branching patterns and the epithelial cell frequencies in the respiratory tract of the Syrian golden hamster has been completed. We used these data to construct a mathematical model of the depositional translocation during extracellular lung clearance. The number of disintegrations per year was calculated for ^{218}Po and ^{214}Po in each airway group using reference radioactive atmospheres. Disintegrations were converted to absorbed dose using the depth-dose distribution in a cylindrical tissue annulus for each alpha particle energy. The resulting doses show a significant difference between the types of cells and locations receiving maximum exposure when the model of the hamster lung was compared to current models of the human respiratory tract. The dose to basal cells in the subsegmental bronchi is 0.4-1.6 rad per working level year (WLY). The mean dose to basal cells is 2-3 rad per WLY. Peripheral basal cells may receive doses approximately equal to doses received by basal cells in the central airways. Moreover, Clara cells in the terminal bronchioles may also receive 2-3 rad per WLY. Since Clara cells have been implicated in hamster lung carcinogenesis, the dose to these differentiated cells may be relevant to inducing tumors. In contrast, models of the human lung suggest that the highest dose to all types of cells is in the higher airways (subsegmental bronchi) and that the cancer-related dose is 3-20 rad per WLY for identical ^{222}Rn -laden atmospheres. Although these results are subject to the limitations inherent in the mathematical modeling of biological phenomena, they indicate that the frequency, location and morphology of ^{222}Rn -induced lung cancer in hamsters may not be a straightforward indication of human response when exposures are expressed in WLY.

3511. Dose assignment criteria for beagles exposed bilaterally to ^{60}Co gamma rays - Angleton G.M. - Collab. Radiol. Hlth Lab., Colorado State Univ., Fort Collins, Colo. 80523 USA - HEALTH PHYS. 1978 35/5 (625-628)

Absorbed dose assignments for bilateral exposures of beagles to ^{60}Co gamma rays may be made using the equation $D = 0.953 \cdot R \cdot \exp(-0.0129 \cdot W)$. D is the absorbed dose in rads. R is the in-air exposure in Roentgens determined at the time of exposure. W is the width in cm of the subject's abdomen. The dose D represents an average abdominal single dose to be used in evaluating dose response relationships.

3512. Plutonium aerosol characterization inside safety enclosures at a demonstration mixed-oxide fuel fabrication facility - Raabe O.G., Newton G.J., Wilkinson C.J. et al. - Inhalat. Toxicol. Res. Inst., Albuquerque, N.M. 87115 USA - HEALTH PHYS. 1978 35/5 (649-661)

Nuclear reactor fuel pellets of PuO_2 and UO_2 are fabricated within safety enclosures at Hanford Engineering Development Laboratory, Richland, Washington. Samples of the aerosols coincidentally

formed during a plutonium oxide and uranium oxide powder mixing operation and during the centerless grinding of mixed oxide reactor fuel pellets were taken from within the safety enclosures. A small seven-stage cascade impactor was used to determine the aerodynamic size distribution and concentration and a spiral-duct aerosol centrifuge, the Lovelace Aerosol Particle Separator (LAPS) was used to study the characteristics of the particles with respect to aerodynamic equivalent size. Alpha spectroscopy showed that up to 11% of the alpha activity of the aerosols was associated with ^{241}Am . In the powder-mixing operation, the aerosol size distributions had activity median aerodynamic diameters (AMAD) equal to 1.9 ± 0.4 (S.D.) μm and geometric standard deviations (sigma g) of 1.59 ± 0.08 ; alpha activity concentrations were best expressed as log-normally distributed with median of 45 nCi/l and geometric standard deviation of 1.8. For the centerless grinding the size distribution had AMAD values equal to 2.3 ± 0.3 (S.D.) μm and geometric standard deviations (sigma g) of 1.6 ± 0.1 ; alpha activity concentrations were much higher with a median of 7 $\mu\text{Ci/l}$ and geometric standard deviation of 1.9. The aerosol particles exhibited significant electrostatic charge. In vitro measurements in a lung fluid simulant showed the aerosol particles formed during powder mixing were more soluble than those formed during centerless grinding. Although relatively insoluble, both types of particles demonstrated higher solubility than reported for laboratory aerosols of high temperature treated $^{239}\text{PuO}_2$.

3513. Aerodynamic and dissolution behavior of fume aerosols produced during the combustion of laser-ignited plutonium droplets in air - Raabe O.G., Teague S.V., Richardson N.L. and Nelson L.S. USA - HEALTH PHYS. 1978 35/5 (663-674)

Radioactive fume aerosols of plutonium oxide produced by condensation of vapors may be formed in conceivable accidents in involving temperatures exceeding 2400°C, such as explosive fragmentation of plutonium metal or postulated breeder reactor accidents. These highly dispensed aerosols consist of ultrafine components (less than 0.1 μm in geometric diameter) and exhibit properties markedly different from the larger particles (larger than 0.1 μm) generally used for evaluation of inhalation toxicology. In this research, which was part of Sandia Laboratories' Plutonium Aerosol Generation Experiments (PAGE) program, studies have been conducted of the aerosols produced by high temperature burning in air of single 50-500 μm -dia droplets of gallium-stabilized, delta-phase plutonium metal ignited with a laser. Mass balance and aerosol measurements demonstrated that essentially all the plutonium lost from the burning droplet (up to 40% of available plutonium) became aerosolized. These aerosols consisted primarily of weblike chains of ultrafine crystalline (cubical) particles (4-100 nm on side) and a few nearly spherical, discrete particles as large as 0.5 μm . These were respirable aerosols with measured activity median aerodynamic diameters of from 1 to 2 μm with geometric standard deviations about 1.5. In vitro dissolution studies demonstrated higher dissolution

was related to the ready mobilization of small particulate components, as well as to the relatively large surface-to-volume ratios of the aerosol particles. Apparent dissolution half-times in the lung (which would be observed as translocation of plutonium from lung to blood and thence to bone and liver) were estimated to be about 200 days.

3514. An isopleth method for population evacuation related to nuclear power reactor accidental release - Bowman W.B., Healy K.E. and Swindle D.L. - Carolina Power Light Co., Raleigh, N.C. 27602 USA - HEALTH PHYS. 1978 35/5 (685-691)

Nomograms are developed for the purpose of determining Xu/Q values corresponding to dose isopleths describing areas of required evacuation. Plotting data for down wind and crosswind distances as a function of stability class and release elevation enable the drawing of the isopleth on a transparent grid, which is placed over the map of the area to direct the needed evacuation.

3515. Modeling of an active nerve fiber in a finite volume conductor and its application to the calculation of surface action potentials - Barker A.T., Brown B.H. and Freeston I.L. - Sheffield Univ., Sheffield GBR - IEEE TRANS. BIO-MED. ENG. 1979 26/1 (53-56)

Potentials within and on the surface of a finite cylindrical volume conductor due to a single active nerve fiber along its center have been calculated by solving Laplace's equation using a relaxation model. The results have enabled the variation of the potential that would be recorded from a surface electrode to be estimated for differing nerve depths and conduction velocities.

3516. Interlaboratory comparison of techniques for measuring lung burdens of low-energy photon-emitters - Newton D., Fry F.A., Taylor B.T. et al. - Environm. Med. Sci. Div., Atom. Energy Res. Establishm., Harwell, Oxon GBR - HEALTH PHYS. 1978 35/6 (751-771)

An interlaboratory exercise has been conducted to assess techniques of detection and calibration in the direct measurement of lung contamination with plutonium and other nuclides emitting only low-energy X-rays. Three volunteers, of small, intermediate and large physique, inhaled an aerosol incorporating ^{103}Pd , a 20-keV X-ray emitter, and visited 13 other laboratories in the U.K., Europe, and North America. Participants in the exercise were asked to estimate each subject's lung content, using their procedures for assessing burdens of plutonium, and their estimates were compared with values derived independently from measurements of ^{51}Cr , also incorporated in the inhaled particles, by gamma-ray spectrometry. Laboratories' calibration procedures were in most cases based on elaborate thorax phantoms, and these generally led to underestimates of the subjects' contents, in some instances by a factor of three or more; only one such laboratory produced estimates in satisfactory agreement with the independently known values. The 'phoswich' detectors, employed by most participants, appeared to be more sensitive than gas counters. If a standard configuration were required,

offering the highest sensitivity in most situations, the choice would be a pair of 12-cm diameter phoswich detectors viewing the left and right anterior surfaces of the upper thorax. No improvement in sensitivity would result from increasing the size, although larger unit may offer other advantages.

3517. Mechanism for exoelectron emission mainly from LiF - Samuelsson L.I. - Dept. Phys., Univ. Linköping, S-581 83 Linköping SWE - ACTA RADIOL. SUPP. 1979 SUPPL. 359 (93p)

In discussions on the possible mechanisms of exoelectron emission, two types of processes need to be distinguished. The first is emission connected with mechanical disturbances of metal oxide samples and the second is emission related to the bleaching of colour centres in insulators. This work is concerned with the latter type and particular attention has been paid to two basic questions, viz., the origin of the rather broad energy distributions of emitted exoelectrons observed and the question as to whether the emission is a bulk effect or a surface effect. Energy distributions of exoelectrons from roentgen- and electron-irradiated samples of LiF, K_2SO_4 , $BaSO_4$ and MgO have been measured in high vacuum conditions. A slightly asymmetric distribution with a full width at half-maximum of about 0.4 eV was observed, almost independent of the temperature, the kind of sample, or the type of irradiation. Measurements on an evaporated LiF film in ultrahigh vacuum conditions gave similar results. The connection between the measured width of the energy distribution of exoelectrons emitted and the energy level diagram of LiF (single crystal) has been investigated using the photoemission technique. As a result, a negative electron affinity was found for LiF, i.e. the bottom of the conduction band is above the vacuum level. This means that electrons excited into the conduction band are free to leave the crystal without needing any further energy. By considering the magnitude of the negative electron affinity and interactions such as electron-phonon scattering, it is found that the width of the energy distribution of exoelectrons should be fairly similar to that actually measured. Together with earlier results, such as those from experiments on additively coloured crystals and investigations into relaxation effects of excited colour centres, the data on optical absorption and thermal bleach optical absorption measurements on the LiF single crystal obtained here indicate that the exoelectron emission connected with colour centre destruction in LiF is a bulk effect. Surface effects will only influence the probability of escape and the energy distribution. Different models of exoelectron emission proposed elsewhere are discussed in the light of the results obtained. It is found that the harmonic model satisfactorily explains exoelectron emission from LiF connected with F-centre bleaching. However, due to the strong electron-phonon interaction, energy distribution measurements alone cannot exclude the possibility that recombination processes are also involved. Although the present investigations have been mainly concerned with LiF, there is reason to believe that similar results will also be found for other alkali halides.

3. GENERAL INSTRUMENTATION

3518. A device for obtaining wrinkleless ultrathin sections on the supported grid: the double grid method - Takahashi H. - I Dept. Anat., Hirosaki Univ. Sch. Med., Hirosaki JPN - J. ELECTRONMICROSC. 1978 27/3 (245-246)

In this method, the author devised a technique which allows the central part of the section to stick on the supporting membrane almost at the same time with its peripheral, due to pooling a small amount of fluid by the aid of a hole of Dia seat mesh. By this device, completely wrinkleless sections could be obtained at a good percentage. To make the purpose successful, it is preferable that freshly evaporated membranes should be used and the large section should be mounted by only one.

3519. Apparatus for the hyperchlorination of rodent drinking water - Bron J., Bywater J.E.C. and Kellett B.S. - Basel Inst. Immunol., Basel CH 4058 SWI - LAB. ANIM. 1978 12/1 (11-12) - summ in GERM

An apparatus is described which has been in use for some time providing uniform, low concentrations of chlorine in mouse drinking water.

3520. A versatile primate cage for a multiple use facility - Stickrod G. - Dept. Psychol., Univ. Oregon, Eugene, Ore. 97403 USA - LAB. ANIM. SCI. 1979 29/1 (121-122)

A mobile-transport-squeeze cage for primates was constructed. The cage contained a clear plastic guillotine door, squeeze apparatus, ventilation holes and locking casters. The squeeze apparatus could be operated by one person.

3521. Statically controlled cooling rate device - Pert J.H. and Dayan G. - Div. Lab. Res., New York State Dept. Hlth, Albany, N.Y. 12201 USA - CRYOBIOLOGY 1979 16/1 (90-96)

A new statically controlled cooling rate device consists of metal plates and insulators which can be modified so as to control heat flow and achieve a considerable range of specific cooling rates. It can thus be adapted to give the desired cooling rates for the cryopreservation of various biological materials. The cassette has been used effectively to cryopreserve human platelets and red blood cells. Its potential advantages over commercial instruments include simplicity of operation, improved reproducibility, and low cost.

3.2. Amplifiers

3522. A subnanoampere current generator circuit technique - Hart B.L. and Masson V.K. - North East London Polytechn., Dagenham, Essex RM8 2AS GBR - PROC. IEEE 1979 67/5 (861-862)

The interconnection of a conventional type of current generator and a 'floating' current-divider network, based on the use of an FET op amp, facilitates the design of a variable subnanoampere direct current generator having a high LF incremental output resistance and a shielded output lead.

3523. Application of FET's in temperature compensation of DC amplifiers - Hanna N.N. - Engin. Sci. Instrumentat. Dept., Nucl. Res. Cent., Cairo EGY - IEEE TRANS. INSTRUM. MEAS. 1979 28/1 (32-36)

Expressions for biasing a junction FET at zero temperature coefficient are derived and checked experimentally. Heating over a wide range of temperature at a fixed bias in this region will show both positive and negative coefficients of a very small value. This property is utilized in the design of a simple dc amplifier in which good overall drift performance is obtained by using a FET biased for nearly zero drift in the first stage. The FET bias is adjusted to provide a drift in the proper direction to compensate for the drift in the main amplifier. An overall drift of less than $20 \mu\text{V}/^\circ\text{C}$ has been obtained when the gain is about 100. The complete circuit is described and the adjustment procedure is outlined.

3.5. Generators

3524. Another design of the successive approximation register for A/D converters - Yuen C.K. - Dept. Informat. Sci., Univ. Tasmania, Hobart AUS - PROC. IEEE 1979 67/5 (873-874)

An alternative design of the successive approximation register is proposed. The design eliminates the dual flip-flop outputs of previous designs.

3525. A noise generator using FM techniques - Kashiwagi E. - Dept. Appl. Phys., Nat. Defense Acad., Hashirimizu, Yokosuka, 239 JPN - IEEE TRANS. INSTRUM. MEAS. 1979 28/1 (3-5)

The power spectra for FM signal modulated by the smoothed random telegraph signal are examined experimentally. These FM signals are the noises of variable bandwidth with power spectrum distributions in Gaussian, rectangular, or concave forms; these forms being determined by the values of the product of the mean number of zero-crossings per second of the random telegraph signal and the time constant of a low-pass filter driven by the random telegraph signal.

3526. An inexpensive manual reset control for stepper motors - Morris D., Dunlavy D. and Tyler I.L. - Dept. Phys., Univ. Missouri, Kansas City, Mo. 64110 USA - J. PHYS. E. SCI. INSTRUM. 1979 12/5 (367-368)

The authors describe an inexpensive TTL circuit for easy manual setting of stepper-motor-controlled devices.

3.6. Telemetric devices

3527. An automatic sequential precipitation sampler - Raynor G.S. and McNeil J.P. - Div. Atmosph. Sci., Brookhaven Nat. Lab., Upton, N.Y. 11973 USA - ATMOS. ENVIRON. 1979 13/1 (149-155)

An automatic sequential precipitation sampler was designed and constructed at Brookhaven National Laboratory to collect precipitation samples for chemical analysis. The sampler is designed to collect both wet and frozen precipitation and to exclude dry fallout between precipitation events. The sampler

consists of a large box containing a turntable holding 30 sampling bottles. Precipitation enters through a funnel on top of the box. Between periods of precipitation, the funnel is closed by a movable cover which is activated by a rain sensor when precipitation starts. Sample bottles are changed automatically and periodically from the time the cover opens. Times of cover opening and closing and of bottle changing are recorded on an event recorder. The sampler has operated successfully since July 1976

3528. Apnea detection without electrodes - Fitzpatrick J.A., Hersey S.L. and Johnson C. Jr. - Biomed. Div., Providence Hosp., Washington, D.C. USA - J. CLIN. ENG. 1978 3/4 (376-378)

A simple device is presented to monitor periods of apnea without the use of electrodes. Conductive rubber tubing which changes its electrical resistance with change in length was incorporated into a belt and attached to an apnea monitor. Thus, the high-frequency current from the apnea monitor flows through the conductive rubber sensor instead of through the patient. This technique eliminates the need for electrodes and electrode paste, makes attachment and removal of the sensor simple, and further improves electrical safety by removing the patients from any direct current pathway to the apnea monitor. The device was experimentally used with a telemetry system.

3529. Single frequency RF powered ECG telemetry system - Ko W.H., Hynecek J. and Homa J. - Engin. Design Cent., Case West. Reserve Univ., Cleveland, Ohio 44106 USA - IEEE TRANS. BIO-MED. ENG. 1979 26/2 (105-109)

It has been demonstrated that a radio frequency magnetic field can be used to power implanted electronic circuitry for short range telemetry to replace batteries. A substantial reduction in implanted volume can be achieved by using only one RF tank circuit for receiving the RF power and transmitting the telemetered information. A single channel telemetry system of this type, using time sharing techniques, was developed and employed to transmit the ECG signal from Rhesus monkeys in primate chairs. The signal from the implant is received during the period when the RF powering radiation is interrupted. The ECG signal is carried by 20 μs pulse position modulated pulses, referred to the trailing edge of the RF powering pulse. Satisfactory results have been obtained with this single frequency system. The concept and the design presented may be useful for short range, longterm implant telemetry systems.

3530. Input offset voltage and current in varicap diode modulators - Herscovici H. - Dept. Res. Developm., Cordis Corp., Miami, Fla. USA - IEEE TRANS. INSTRUM. MEAS. 1979 28/1 (36-41)

An analytical study about the input offset voltage and current in varicap diode modulators is presented. Some relations for defining their value and their temperature drift are established. Diode selection to minimize the offset voltage and current is considered. Analytical results are proven in an electronic electrometer with a modulator using reverse polarized

diodes. With this electrometer a $31 \mu\text{V}/^\circ\text{C}$ input offset voltage, a 0.1-pA input offset current and a $0.016 \text{ pA}/^\circ\text{C}$ temperature drift are obtained.

3.8. Cameras

3531. Measurement of adenosine triphosphate content in single red blood cells using the firefly bioluminescent reaction - Kostuk R.K., Muhs A.G., Kirkpatrick F.H. and Gabel C.W. - US Coast Guard, Res. Developm. Cent., Groton, Conn. 06340 USA - APPL. OPT. 1979 18/10 (1527-1532)

A unique optical instrument is described which uses the firefly bioluminescent reaction to measure adenosine triphosphate (ATP) levels in single red blood cells. The method allows chemical content level to be associated with individual cell features. The optical instrument consists of a phase contrast microscope to view cells, a pulsed argon-ion laser to rupture the cell membrane, and a photon counting system to measure the bioluminescent yield. The technique has been calibrated against a standard ATP measurement using bulk analysis methods. The ATP loss mechanism for blood cells in a controlled depletion experiment was also investigated.

4. COMPUTERS

3532. The genetic graph: A representation for the evolution of procedural knowledge - Goldstein I.P. - Xerox Palo Alto Res., Palo Alto, Calif. 94304 USA - INT. J. MAN-MACH. STUD. 1979 11/1 (51-77)

I shall describe a model of the evolution of rule-structured knowledge that serves as a cornerstone of our development of computer-based coaches. The key idea is a graph structure whose nodes represent rules, and whose links represent various evolutionary relationships such as generalization, correction, and refinement. I shall define this graph and describe a student simulation testbed which we are using to analyze different genetic graph formulations of the reasoning skills required to play an elementary mathematical game.

3533. A structured planning and debugging environment for elementary programming - Miller M.L. - Artific. Intelligence Lab., MIT, Cambridge, Mass. 02139 USA - INT. J. MAN-MACH. STUD. 1979 11/1 (79-95)

How could an appropriately structured environment facilitate the acquisition of programming skills? Significant theoretical strides are needed before human-quality performance can be expected from a computer-based programming tutor. As an intermediate step, a system has been implemented which serves primarily as an editing language and diligent clerk. However, it differs from conventional programming environments in two crucial ways: (1) it interacts with the student using a vocabulary of concepts about planning and debugging, derived from an explicit model of the design process; and (2) it actively prompts the student with a menu of design alternatives, within the overall framework of a mixed-initiative dialogue. The current system is not a tutor; but the process of implementing and testing it has been instrumental in refining our model of the design

process, thereby bringing us a step closer to realizing a computer-based programming tutor.

4.3. Digital computers

3534. Computer-aided measurement - Brignell J.E. and Young R. - Dept. Electr. Electron. Engin., City Univ., London EC1V 0HB GBR - J. PHYS. E. SCI. INSTRUM. 1979 12/6 (455-463)

Computer-aided measurement is treated as a subject distinguished from the general field of laboratory automation by the intrinsic role of the computer in the solution of fundamental measurement problems. The ways in which the various roles of the computer (data logging, control, signal processing, interpretation and dynamic modelling) can be combined to provide powerful measurement methods are discussed with the aid of examples from the literature. Attention is also drawn to the pitfalls associated with computer power. The influence of the introduction of microcomputers is traced with particular reference to recent applications in scientific and medical measurements.

5. SPECIFIC MEASUREMENTS

5.1. Temperature measurement

3535. Electrically quiet temperature controller - Yeandle S. - Dept. Environm. Biosci., Nav. Med. Res. Inst., Bethesda, Md. 20014 USA - BRAIN RES. BULL. 1979 4/1 (139-140)

A circuit for an electrically quiet temperature controller is described that is suitable for controlling the temperature of a neurophysiological preparation above ambient temperature. By not generating spurious electrical signals, it facilitates the recording of low level biological potential changes when temperature control is required. The device, constructed of standard electronic components, uses a thermistor as a sensing element and an ordinary heat lamp or heating strip as a heating element.

3536. Monitor and analyser of temperature and humidity - Iltis R., Schwarberg A., Patterson R. et al. - US Environm. Protect. Agency, Hlth Effects Res. Lab., Cincinnati, Ohio 45268 USA - J. PHYS. E. SCI. INSTRUM. 1979 12/5 (364-367)

An automatic system to monitor temperature and humidity in biological exposure chambers has been developed. The sensing of humidity is based on the psychrometric principle and monitors 24 chambers, each fitted with two thermometers (thermistors) acting as dry and wet bulbs. The temperature of the dry bulb has a range of $10\text{-}43^\circ\text{C}$ with a linearity better than 0.1% . Each chamber is sampled for $2\frac{1}{2}$ min and the temperatures (as functions of thermistor resistance) are converted into proportional voltages which are fed into a microprocessor. This controls the necessary steps to calculate the relative humidity from the two temperatures. The range of the measured humidity extends from 14 to 100% , with $3\text{-}4\%$ maximum error. The calculations are performed on a mathematical model that relates relative humidity to dry and wet temperatures in degrees Fahrenheit or Celsius measured at a given pressure. The results are displayed

in a digital form and are also printed on a strip chart recorder. The print-out shows the chamber number being monitored, the dry-bulb temperature and the relative humidity of the respective chamber.

3537. Digital ventilated psychrometer - Nantou Y. - Industr. Res. Inst. Kanagawa Prefecture, Yokohama JPN - IEEE TRANS. INSTRUM. MEAS. 1979 28/1 (42-45)

A digital ventilated psychrometer for direct reading of the relative humidity (RH) from the digital indicator by means of two identical type thermistors is described. The method is based on the temperature to linear voltage converter, the calculator of the dry and wet bulb temperature ratio, the converter from the ratio to the voltage proportional to RH, and the analog to digital (A/D) converter. The experimental result by the digital ventilated psychrometer shows that the apparatus makes the direct indication of RH possible. The accuracy of the apparatus is estimated to contain an RH error of less than 2 percent and it is almost the same as that of the Assmann psychrometer. The principal advantage of the apparatus is the direct indication of RH and the capability to use the data directly for the input of the digital data processor.

5.2. Time measurement

3538. Accurate measurement of time with the oscilloscope (Germ) - GENAUE ZEITMESSUNG MIT DEM OSZILLOSKOP - Rahn K. - Fa Hewlett-Packard GmbH, Boblingen GFR - ELEKTRONIK 1978 27/15 (45-50)

The progressively increasing part of digital systems in electronics enhances the importance of time-related parameters and renders it necessary that measurements of lengths of time and of time intervals become even more accurate, and should be reliable even in the nanosecond range. The importance in this respect of modern oscilloscope technique is described in this paper.

5.3. Frequency measurement

3539. Comparison of four beat-to-beat cardiometer designs - Mason C.A. and Shoup J.F. - Div. Engin. Technol., Pennsylvania State Univ., Capitol Campus, Middletown, Pa. 17057 USA - MED. BIOL. ENG. COMPUT. 1979 17/3 (349-359)

Beat-to-beat cardiometers calculate the heart rate in beats per minute from two adjacent R wave pulses. These differ from cardiometers, which simply count the number of R waves pulses in a minute. The paper describes four beat-to-beat cardiometer systems using (a) divide-by-n counter; (b) calculator chip; (c) 1/t clock; (d) dual analogue voltage ramp. For each type a detailed description of operating principles based on a block diagram is presented. This is followed by a discussion of the performance of each system, the compromises that are required and the fundamental limitations of each system. One practical design of each system has been built and used successfully in a medical or biomedical situation. These are also described and compared.

5.4. Pressure measurement

3540. A device for measuring plantar pressures under the sole of the foot - Betts R.P. and Duckworth T. - ENG. MED. 1978 7/4 (223-228)

An apparatus is described which gives a rapid and detailed picture of the distribution of pressure under the foot with quantitative information, the pressure distribution being displayed as either a continuous grey scale or a colour contour map on a television monitor. A theoretical analysis of the operating principles is given with evidence for its validity, and the practical problems associated with the more detailed aspects of the equipment are discussed.

3541. Quality control of pressure-measuring instruments - Nippa J.H. - Tacoma Gen. Hosp., Tacoma, Wash. USA - J. CLIN. ENG. 1978 3/4 (343-346)

The measurement and monitoring of blood pressure by means of catheters and strain gauges may have errors due to unstandardized transducers and amplifiers. Inaccuracies in measurement were found to be over 10% in a large hospital. Causes for these errors were analyzed, and methods for reducing errors are presented. It is shown that to maintain accuracy, strain gauges must have equal and exactly known sensitivity factors and that amplifiers have to exhibit constant gain and offset. The design of a simple and accurate strain gauge simulator with a precision of better than 0.3% is presented, and formulae for component selection and error analysis are developed. It is concluded that an appropriate quality control program for pressure-measuring equipment will uncover problem areas and ensure accurate pressure measurements.

5.5. Flow measurement

3542. Experience with a newly developed automatic uroflowmeter - Kloppe P.J. and Bruijnes E. - Lab. Exp. Surg., Wilhelmina Gasth., Univ. Amsterdam NLD - UROL. INT. 1979 34/2 (114-125)

An automatic cabin uroflowmeter was developed in order to guarantee the privacy of the patient, to simplify the measurement and in particular, for screening. The meter is based on the method of von Garrelts, and the registration is performed with a music cassette. After an extensive calibration, 76 measurements from 22 persons without urologic complaints and 42 measurements from patients were analyzed. The obtained values of the control group, as well as those of the patient group were comparable to the data mentioned in literature. A normogram is presented correlating maximum flow rate and voided volume.

3543. Procedure for symmetric orientation of hot-wire probes - Gilbert B. - Univ. Illinois, Chicago, Ill. 60680 USA - REV. SCI. INSTRUM. 1979 50/5 (632-634)

A quick and simple procedure was developed for setting the sensing elements of an X-hot wire probe to be symmetric to the mean flow direction. The angle that the probe axis makes with the mean flow direction is changed until a properly conditioned voltage is

maximized. This procedure does not require the rather restrictive assumptions of matched linear wire sensitivities, symmetric were orientations to the probe's axis, wire mutual perpendicularity, or known mean flow direction. After the mean flow direction is determined, the linear sensitivities are matched and the probe is calibrated.

5.6. Flow resistance measurement

3544. Modification of miniature flush surface wall shear probes for biomedical use - Tillmann W. and Schlieper H. - *Helmholtz-Inst. Biomed. Techn., D-5100 Aachen GFR* - J. PHYS. E. SCI. INSTRUM. 1979 12/5 (371-372)

A method for proper alignment of commercially available miniature wall shear probes for biomedical application is described. Geometrical irregularities at the bottom of the probe due to the soldered joints of the connection wires are the reason why the probes cannot be mounted in a well defined position. By means of a casting technique a probe body with a defined rotationally symmetric cross-sectional area is obtained, which can be inserted into a mounting bore. This modification results in simpler and faster fixation and higher durability of the probes.

3545. A device for the calibration of hot-film wall shear probes in liquids - Tillmann W. and Schlieper H. - *Helmholtz-Inst. Biomed. Techn., D-5100 Aachen GFR* - J. PHYS. E. SCI. INSTRUM. 1979 12/5 (373-380)

A new device for the calibration of flush-mounted hot-film wall shear probes in liquids is presented. It consists of two concentric cylinders with the outer one rotating. Laminar Couette flow is established within the gap. The inner stationary cylinder holds the probes. Thus, the analytical determination of the shear stress at the wall of the inner cylinder allows the calibration of the probes. Temperature control of the test liquid during the calibration procedure is provided by two separate circuits, since exact temperature control is essential for this measurement technique.

Representative results measured in the apparatus for shear stresses in the range from $\tau_w = 1.3$ to 30 N m^{-2} are presented and the influence of temperature fluctuations on the probe signal is investigated theoretically and experimentally. The data show that the apparatus is suitable for determination of the constant A and the expression B(T) in the equation $Nu = A + B(T)\tau_w(1/3)$, which gives the dimensionless heat transfer as a function of the wall shear stress.

5.11.1. Electrical activity measurement

3546. Single-epoch somatosensory evoked potentials at vertex: A time window specified for electro-ocular monitoring - Stowell H. - *ERBP, Rivers Lab., Cent. State Hosp., Milledgeville, Ga. 31062 USA* - *ELECTROENCEPHALOGR. CLIN. NEUROPHYSIOL.* 1979 46/2 (220-223) - summ in FREN

Single-epoch and small-n somatosensory evoked potentials (SEP) were recorded vertex toinion with simultaneous fronto-orbital derivations in 2 experienced normals and 1 naive bilateral enucleate,

during self-administered, transcutaneous electrical stimulation of a finger pad, which was subjectively scored for pain magnitude. Single epochs had significantly greater amplitude, without significant temporal differences, compared to signal-averaged SEP. But for both normals, contradicting previous documentation of 'nociceptive' SEP, apparent polarity reversal of SN 140 of the vertex potential (VP) occurred at upper bony orbit and nasion, while VP amplitude of the single-epoch SEP was a poor predictor of pain scores ≥ 2.5 , contrary to previous data from signal-averaged SEP and subjectively 'averaged' pain estimates. The enucleate showed only wave forms in phase with SN140 of the VP at both upper orbital and superior, frontal electrodes. In all 3 subjects, weaker stimulation near or below subjective pain thresholds also evoked only the expected, smaller wave form in phase with SN140, while small-n averages ($16 \geq n \geq 4$) attenuated the upper orbital phase reversal in the normals. This apparent electro-orbital artifact occurred within an 80-200 msec time window after intense stimulation only, had some characteristics of both blink and saccadic eye movement, and was not consistently suppressed by attempted fixation in experienced subjects. Being of extremely variable amplitude but relatively consistent latency and wave form, during intense stimulation only, it may confound amplitude measures of the VP in single-epoch 'nociceptive' SEP, whether raw or adaptively filtered.

5.12. Gas concentration measurement

3547. What is new in blood-gas analysis? - Blackburn J.P. - *Dept. Clin. Measur., Westminster Hosp., London S.W.1. GBR* - BR. J. ANAESTH. 1978 50/1 (51-62)

Basic methods of blood-gas analysis have remained largely unchanged during the past few years, although refinements in electrode performance have been introduced. In the past, provision of an effective clinical blood-gas service has not always been easy, as specially trained staff have had to be available at all times to operate and maintain conventional blood-gas equipment. With the introduction of automatic analysers, operator error is almost eliminated and machines can be used by untrained staff at any time. However, faulty blood sampling is a potent source of error and the complexity of modern analysers makes it essential that adequate maintenance and quality control procedures are instituted. Methods of measuring oxygen saturation and oxygen content have been introduced which are technically less demanding than those used previously, and in general blood-gas analysers of all types are becoming easier to use, although versatility of operation is being sacrificed in some cases. 85 References have been cited.

3548. Measurement of myocardial PCO_2 with a microelectrode: Its relation to coronary sinus PCO_2 - Case R.B., Felix A. and Wachter M. - *Lab. Exp. Cardiol., Dept. Med., St Luke's Hosp. Cent., New York, N.Y. 10025 USA* - *AM. J. PHYSIOL. HEART CIR. PHYSIOL.* 1979 5/1 (H29-H34)

A micro- PCO_2 electrode, with dimensions of 1×10

mm, and a 63% response time of 14 sec was inserted into the left ventricular myocardium of the pentobarbital-anesthetized dog. Continuous recordings were made of myocardial PCO_2 (PmCO_2), arterial PCO_2 (PaCO_2), and coronary sinus PCO_2 (CSPCO_2) during variation of respiratory rate. PmCO_2 and CSPCO_2 were compared at varying coronary flow. PmCO_2 was similar to and closely followed changes in CSPCO_2 . The difference between PmCO_2 and CSPCO_2 was -0.52 ± 3.63 (SD) mmHg, and PmCO_2 exceeded PaCO_2 by 20.69 ± 5.12 mmHg. After coronary occlusion, PmCO_2 rose promptly, but CSPCO_2 was only slightly elevated until the occlusion was released, when a CO_2 efflux into the coronary sinus occurred. It is concluded that the electrode measures extracellular PCO_2 and that extracellular and myocardial PCO_2 are essentially equal. PmCO_2 rises rapidly following coronary occlusion.

3549. Oxygen analyzer dangerous - senses nitrous oxide as battery fails - Piernan S., Roizen M.F. and Severinghaus J.W. - Univ. California Sch. Med., San Francisco, Calif. 94143 USA - *ANESTHESIOLOGY* 1979 50/2 (146-149)

Two IL 402 oxygen monitors, used in the anesthetic breathing circuit, were noticed to malfunction during anesthesia, reporting falsely high O_2 concentrations. Both instruments had been calibrated and the batteries checked prior to anesthetic induction. Since the first malfunction occurred in 1976, before the manufacturer notified users to check possible N_2O sensitivity, the authors did not check the N_2O zero before use. The second failure occurred recently, and the instrument was shown not to respond to N_2O before induction. In one of these instances, the monitor was being used to control the addition of O_2 to a closed system. This error could have been disastrous. The two cases are presented, together with results of tests done on 15 other IL 402 sensors and an investigation of the source of the error.

3550. In vivo calibration of flow-dependent blood gas catheters - Lundsgaard J.S., Groenlund J. and Einer-Jensen N. - Dept. Physiol., Univ. Odense, DK-5000 Odense DNK - *J. APPL. PHYSIOL. RESPIR. ENVIRON. EXERCISE PHYSIOL.* 1978 44/1 (124-128)

In vivo calibration of blood gas catheters is complicated by the fact that their signals are flow dependent. A calibration method is described here, which permits continuous in vivo calibration. The principle is to compensate for flow dependence through simultaneous measurement on an inspired, inert reference gas of known partial pressure. The method is demonstrated by experiments on three anesthetized dogs, in which the arterial oxygen partial pressure was measured in situ with a flow-dependent blood gas catheter. The compensated signal was in good agreement with the partial pressure of oxygen measured with conventional techniques.

3551. A sensitive continuous and discontinuous photometric determination of oxygen, carbon dioxide, and carbon monoxide in gases and fluids - Lang W., Wolf H.U. and Zander R. - Physiol. Inst., Univ. Mainz

D-6500 GFR - *ANAL. BIOCHEM.* 1979 92/2 (255-264)

The paper describes a sensitive, rapid, and precise photometric method for the continuous and discontinuous determination of O_2 , CO_2 and CO . The method is based on highly specific color reactions: O_2 is determined by its reaction with alkaline catechol + Fe^{2+} yielding intensively colored products, CO_2 is determined by its color reaction with a solution of fuchsin + hydrazine; and CO is determined by its reaction with hemoglobin. The basic experimental equipment is that of the AutoAnalyzer, with an additional chamber for the injection of small gas samples in the case of the discontinuous analysis. Continuously analyzing in a standardized gas flow of 1 $\text{ml} \cdot \text{min}^{-1}$ (STPD), the lower limits of the sensitivities are 50 ppm for O_2 , 100 ppm for CO_2 and 50 ppm for CO . The discontinuous analysis of the three gases requires the basic experimental equipment plus an airtight chamber. The lower limits of the amounts are 0.1 μl (STPD) for O_2 , 0.2 μl for CO_2 and 0.1 μl for CO .

3552. Measurement of ozone in an aircraft - Van Heusden S. and Mans L.G.J. - Philips Res. Lab., Eindhoven NLD - *PHILIPS TECHN. REV.* 1978/79 38/4-5 (131-134)

In a joint study KLM, Eindhoven University of Technology and Philips Research Laboratories, Eindhoven, have measured the ozone content in a DC 10-30 jet aircraft during a flight from Amsterdam to Toronto and back. The measurements showed that there is a strong correlation between the ozone content inside and outside the aircraft, and that 60 to 70% of the ozone contained in the atmosphere is admitted to the passenger and crew compartments. It was also found that the ozone content depends to a great extent on the altitude relative to the tropopause. The measurements reveal that the TLV (Threshold Limit Value) now applicable in the IATA countries was exceeded during most of the flight.

5.13. Hydrogen ion concentration measurement

3553. A study of the pH monitor in cats - Hochberg H.M., Lauersen N.H., George M.E.D. and Van Poznak A. - Dept. Obstet. Gynecol., New York Hosp., Cornell Med. Cent., New York, N.Y. 10021 USA - *ARCH. GYNECOL.* 1978 226/1-2 (39-43) - summ in GERM

A study of the accuracy of the tpH electrode was performed in 10 cats. Hypoxia and acidosis were produced by ventilatory means and bicarbonate infusions were used to elevate the pH. Tissue pH correlated well with arterial ($r=0.9$) within the physiological rates of change of pH. Prolonged tissue acidosis led to eventual death. The correct and stable mechanical fixation of the pH electrode is a critical factor in assuring accurate results. The Roche tpH electrode accurately reflects arterial pH, and a correlation coefficient of at least 0.85 should be attainable in the human fetus.

5.14. Radiation measurement

3554. Cerebral application of homogeneous magnetic fields. Preliminary report (Czch) - Grunner O. - Rehab.

Odd. NsP Jesenik CSK - LEK. TECH. 1978 NO. 1 (2-6) - summ in ENGL, RUSS

This report follows effects of an homogenous magnetic field of 8.8 G, 26.6 G and of 200 G of magnetic induction in therapy of insomnia and anxiety. The cerebral application of these fields always lasted one hour. It was ascertained, that the effects of the homogenous magnetic field of 8.8 G and 26.6 G are not significant, even when the trends come near to the significance. However the significant effect of cerebral application of an homogenous magnetic field of 200G, led to sleep or sleepiness in contrast to the sham treatment. A significant rise of electric dermal resistance after the end of the treatment was ascertained. It is consequential, that the rise of electric dermal resistance (followed by means of electrodes, located on the supraorbital regions of the front) was more expressive in starting damping, not only on statistical evaluation, but also at each real treatment of every patient - in comparison to the application of sham treatment. Attention is given to the fact, that it is possible to use an homogenous field of 200 G for better and faster healing of osseous fractures, in therapy of thrombophlebitis of the lower extremities and also in the therapy of cerebral thrombosis. It is necessary to pay the attention to this direction of therapy.

3555. A possible magnetic transducer in birds - Yorke E.D. - Dept. Phys., Univ. Maryland Baltimore County, Catonsville, Md. 21228 USA - J. THEOR. BIOL. 1979 77/1 (101-105)

A growing body of evidence indicates that a variety of animals can sense the earth's magnetic field. The possibility that the transducer of the magnetic sense is a microscopic ferromagnet of the sort observed in certain bacteria is examined theroretically. Neither energy and response time considerations nor existing experimental evidence make such a transducer implausible.

5.14.1. Visible light

3556. Use of a surgical laser in the removal of brain tumors - Perria C., Borzone M., Guiducci G. et al. - Clin. Neurochir., Univ. Genova ITA - IRCS MED. SCI. 1979 7/1 (19) SU

The carbon dioxide laser in neurosurgery for tumors is more helpful than traditional techniques for the following reasons: it gives the best capillary haemostasis and a smaller blood loss during the removal of very vascularized tumors; it provides the possibility of vaporizing the neoplasms without touching them and therefore reduces the risk of scattering tumor cells; there is little heat diffusion to tissues surrounding the irradiated zone; there are no electromagnetic fields; moreover, the laser provides a more gentle means of removing tumors than traditional techniques.

3557. Ocular hazard of short pulse argon laser irradiation - Lund D.J. and Beatrice E.S. - Dept. Biomed. Stress, Letterman Army Inst. Res., Presidio of San Francisco, Calif. 94129 USA - HEALTH PHYS. 1979 36/1 (7-11)

Primate retinæ were exposed to short duration laser

pulses obtained by acousto-optically shuttering a continuous wave (cw) argon laser beam at 514.5 nm. The beam delivery optics were designed to produce large retinal irradiance diameters. The ED₅₀ is defined as that dose which will produce ophthalmoscopically visible damage in one-half the exposures.

3558. A schematic eye for the opossum - Oswaldo-Cruz E., Hokoc J.N. and Sousa A.P.B. - Dept. Neurobiol., Inst. Biofis. UFRJ, Cent. Ci. Saude, Rio de Janeiro BRA - VISION RES. 1979 19/3 (263-278) - summ in FREN

Schematic values were determined for the elements of the dioptric system of the eye of a marsupial, *D. marsupialis aurita*. Based on measurements on excised eyes a schematic eye was developed for this species. The following aspects of the opossum's eye are discussed: real, entrance and exit pupils, retinal illumination and unioocular optical field. The extent of the retinal visual field was determined and the resulting cyclopic field established. The position of the blind and optic axes in space were indirectly determined by correlating the posture of the head under experimental and normal conditions, and the horizontal meridian was found to lie 4° below the blind axis.

3559. Difference between continuous wave and superpulse carbon dioxide laser in bladder surgery - Rattner W.H., Rosemberg S.K. and Fuller T. - Dept. Urol., Sinai Hosp., Detroit, Mich. USA - UROLOGY 1979 13/3 (264-266)

Adult exteriorized rabbit bladders were treated with both continuous wave and rapid superpulsed laser energy. A carbon dioxide laser was utilized in these studies. Time and power density were varied, and the effect in both acute and delayed preparations was noted. An additional group of animals treated with the carcinogen dibutyl nitrosamine was studied in a similar manner. The depth of tissue ablated was monitored by the operating microscope and varied from 1 to 2 mm., using the power time grid we employed. Not only could the depth of destruction be controlled, but also re-epithelialization was apparent in one and one half to three and one half weeks after destruction. Differences between superpulsed and continuous wave carbon dioxide laser energy are compared.

5.14.2. Ultraviolet radiation

3560. Vacuum ultraviolet scintillators: sodium salicylate and p-terphenyl - Kumar V. and Datta A.K. - Phys. Res. Lab., Navrangpura, Ahmedabad IND - APPL. OPT. 1979 18/9 (1414-1417)

Some of the characteristic properties of sodium salicylate and p-terphenyl have been studied at a convenient incident wavelength of 253.7 nm. These include the fluorescent spectrum, relative quantum efficiency as a function of scintillator thickness, absolute quantum efficiency, and its possible decline with time. It has been shown that the rotary pump and diffusion pump oil vapors in contact with phosphors affect the stability of fluorescence in a marked but complicated manner. The effect of humidity on relative fluorescent quantum efficiency of the phosphors has

also been discussed. p-Terphenyl has been found to be a useful alternative to sodium salicylate.

5.14.4. Radiowaves

3561. A review of microwave oven safety - Osepchuk J.M. - Raytheon Res. Div., Waltham, Mass. 02154 USA - J. MICROWAVE POWER 1978 13/1 (13-26)

The microwave leakage from current microwave ovens, which are manufactured to meet government emission standards, is reviewed. Typical leakage values imply exposure values well below the most conservative exposure standards in the world. A review of recent developments discloses increasingly stringent government regulation along with advances in techniques for suppression of microwave leakage. The nature of the leakage field is described and studies relating emission to exposure are reviewed. Field survey data are reviewed and it is found that the overwhelming majority of certified ovens in the field show leakage well below permissible limits with an increasing degree of certainty as time goes on. The conclusion is that microwave ovens are not only just as safe as they were in 1973 but they are being accepted as safe under essentially equivalent emission regulations in various countries including those in Eastern Europe.

3562. Observations of mouse fetuses after irradiation with 2.45 GHz microwaves - Berman E., Kinn J.B. and Carter H.B. - Environm. Protect. Agency, Hlth Effects Res. Lab., Exp. Biol. Div., Environm. Res. Cent., Research Triangle Park, N.C. 27711 USA - HEALTH PHYS. 1978 35/6 (791-801)

Pregnant CD-1 mice were exposed to 2.45 GHz CW radiation for 100 min daily at a range of power densities (3.4-28 mW/cm²). Near-term fetuses were examined for gross external morphologic alterations. Mean live fetal weight per litter decreased significantly with exposure to the highest power density (sham, 0.97 ± 0.15 g; irradiated, 0.89 ± 0.13 g). There was a significantly increased incidence of cranioschisis in exposed fetuses. An exposure of the dam for 100 min at these power densities did not appear to be significant thermally. Estimates of mean dose rate as determined using twin-well calorimetry ranged from 2.0 to 22.2 mW/g.

3563. Improvement of scanning radiometer performance by digital reference averaging - Bremer J.C. - Space and Data Syst. Div., ORI, Inc., Silver Spring, Md. 20910 USA - IEEE TRANS. INSTRUM. MEAS. 1979 28/1 (46-54)

Most radiometers utilize a calibration technique in which measurements of a known reference are subtracted from measurements of unknown source so that common-mode bias errors are cancelled. When a radiometer is scanned over a varying scene, it produces a sequence of outputs, each being proportional to the difference between the reference and the corresponding input. The reference averaging technique presented herein employs a simple digital algorithm which exploits the asymmetry between the time-variable scene and the nominally constant reference input by averaging many reference measurements to decrease the statistical uncertainty in the reference value. This

algorithm is, therefore, optimized by an asymmetric chopping sequence in which the scene is viewed for more than one-half of the duty cycle (unlike the analog Dicke technique).

5.14.5. Roentgen radiation

3564. Rapid computation of diagnostic X-ray bremsstrahlung spectra - Stanton L., Day J.L., Lightfoot D.A. et al. - Dept. Radiat. Therapy Nucl. Med., Hahnemann Med. Coll. Hosp., Philadelphia, Pa. 19102 USA - RADIOLOGY 1979 130/2 (477-484)

A method is described for rapid and accurate computation of diagnostic X-ray spectra. Accuracy limitations of Kramers' equation are overcome by providing intensity correction factors derived from published measured data. Use of a parameter based on the energy of the Kramers spectrum intensity peak permits deriving master factor curves which are remarkably independent of kVp, waveform and filtration. Computed and measured spectra generally agree to better than ± 1 keV for beams generated at 100 kVp and below. Possible application of the method to higher energy diagnostic beams is discussed.

3565. X-ray absorption, speed, and luminescent efficiency of rare earth and other intensifying screens - Venema H.W. - Lab. Med. Phys., Univ. Amsterdam NLD - RADIOLOGY 1979 130/3 (765-771)

Seven new and two conventional screens were investigated. Measurements were performed at different energies of the photon fraction interacting in the screens, and energy losses due to escape of K-fluorescent radiations were calculated. The speed of the screens was dependent on the energy; this was primarily due to the fact that X-ray absorption is dependent on energy. Rare earth and other new screens absorb a maximum of 1.5 times as much energy and emit twice as much light as comparable calcium tungstate screens. Reabsorbed K-fluorescent radiations might contribute to image unsharpness in the new screens.

3566. Large-scale time-sharing X-ray generators. Statistical considerations related to ensuring reliability using redundant components - Gelfand D.W. and How J.R. - Dept. Radiol., Bowman Gray Sch. Med., Winston-Salem, N.C. 27103 USA - RADIOLOGY 1979 130/2 (535-536)

A time-sharing generator capable of serving a significant fraction of a radiology department's examining rooms is proposed. Requisite reliability is achieved by incorporating redundancy of the generator's major components. Statistics drawn from service records of 37 modern generators suggest that a time-sharing generator with moderate redundancy of components might achieve the required high order of reliability.

5.14.6. Alpha, beta and gamma radiation

3567. The method of restoration of images in gammatopography (Russ) - Tsarkov S.A., Fishman L.Ya. and Kostylev V.A. - Onkol. Nauch. Tsent., AMN SSSR, Moscow SUN - MED. RADIOL. 1978

23/9 (51-57) - summ in ENGL

On the basis of the analysis of the possible methods of adequate restoration of radioisotope images a technique was elaborated making it possible to compensate for the effect of the recording system and to adapt to statistical fluctuations that provides a rise in space resolution of gammatopography studies 1.6 fold. For practical realization of the method a computer of small capacity (mini-computer) is sufficient, and treatment of diagnostic information is not associated with considerable consuming of the machine time (75 sec for the matrix of 64×64). Results of phantom and clinical tests of the method are discussed.

3568. Alpha irradiation of the skin and the possibility of late effects - Sevcova M., Sevc J. and Thomas J. - Dept. Dermatol., Hlth Inst. Uranium Industry, 261 00 Pribram CSK - HEALTH PHYS. 1978 35/6 (803-806)

Considering new data on the epidermal thickness, an estimate was made of the dose equivalent delivered to the basal layer of the epidermis from external alpha radiation by ^{222}Rn daughters. Following exposure of many years in uranium mines, the possible cumulative dose exceeds 1000 rem. The results of a 8-yr observation showed a higher observed frequency of basal cell carcinomas of the skin in uranium miners.

3569. Incorporation of tritium in grain plants - Garland J.A. and Ameen M. - Environm. Med. Sci. Div., AERE, Harwell GBR - HEALTH PHYS. 1979 36/1 (35-38)

Maize and barley plants were grown from seed for a period of 30 days in an enclosure in which the soil water and atmospheric vapor contained equilibrium concentrations of tritiated water. At the end of the experiment the plant water of the maize and the barley and the braley contained 95 and 84%, respectively, of the environmental concentration of tritium. The tritium-to-hydrogen ratio in plant dry matter was 60% for maize and 45% for barley of the environmental tritium-to-hydrogen ratio. The results show a significant isotope effect which reduces the tritium content of food grown in a continuously contaminated environment.

3570. Gamma-camera imaging: Importance of energy resolution - Steidley J.W., Miller D.W. and Schlosser P.A. - Nucl. Prod. Line, Picker Corp., Northford, Conn. USA - APPL. RADIOL. 1979 8/1 (136-141)

A method of comparing the performance of gamma cameras for nuclear medicine is described. A computer simulation was used to isolate and thus to highlight the effects of energy resolution on gamma-camera imaging. Imaging of low-contrast lesions was used to show that energy resolution is important in reducing the image-degrading effects of patient-scattered radiation. Quantitative results that compare presently available scintillation cameras and germanium cameras that may be available in the future for clinical applications are presented. It is shown that a fivefold increase in the minimum detectable volume of a low-contrast lesion can be obtained using a high-resolution collimator and a germanium detector versus the same collimator and scintillation detector. The improvement is a sole result

of energy resolution with no sacrifice in efficiency.

3571. Improved photodocumentation of nuclear medical examinations with the gamma camera in a comparison with other methods (Germ) - VERBESSERTE PHOTODOKUMENTATION NUKLEARMEDIZINISCHER UNTERSUCHUNGEN MIT DER GAMMA KAMERA IM VERGLEICH MIT ANDEREN METHODEN - Reuter H.J., Reuter M. and Loenicker E. - Humboldtstr. 16, D-7000 Stuttgart GFR - BIOMED. TECH. 1979 24/3 (51-53) - summ in ENGL

Experience and comparative investigations have proved that photographic documentation is qualitatively superior to most conventional techniques. The video screen of the data processing system of the Gamma Camera displays 64 shades of gray, all of which are reproduced on the roll film. X-ray film conventionally used in nuclear medicine reproduces only 10 shades of gray. Polaroid film produces images of inadequate quality. A comparison of costs shows that roll film documentation is less expensive than the other methods. This applies both to the capital outlay and the running costs.

3572. Quebec clinical dosimetry system for X-ray, cesium-137, and cobalt-60 equipment (Germ) - QUEBECKER METHODE ZUR KLINISCHEN DOSIMETRIE FÜR RONTGENAPPARATE SOWIE CASIUM-137- UND COBALT-60-BESTRAHLUNGSGERÄTE MIT KONSTANTE QUELLE-HAUT- UND QUELLE-ZENTRUM-ABSTANDEN - Legare J.-M., Bresse J., Saint-Onge B. et al. - Sect. Radioprotect., Serv. Protect. Environm., Gouvernm. Quebec CAN - STRAHLENTHERAPIE 1979 155/3 (188-199) - summ in ENGL, FREN

The authors present a Quebec dosimetry system which permits to obtain instantaneously the exact axial dose distribution for single and opposite fields for X-Ray, cesium-137 and cobalt-60 equipment operating at constant FSD or SSD and at constant FCD or SCD. It suffices to slide the patient cross-section horizontally along the true size triangular chart which corresponds to the chosen treatment plan and read the values. The only calculation needed is that for the treatment time. The results as obtained by computer are free of any error due to the thickness limitation between 0 and 26 cm. This work presents examples of the 1216 charts already made on true scale for constant FSD and SSD as well as other reduced charts taken from the 754 completed charts for constant FCD and SCD. The two volumes already published contain these great numbers of true scale charts for several HVL between 1.0 to 14.9 mm copper and this for 25 to 31 single and opposite fields which are circular, square and rectangular at the treatment distances most used in the clinical field. Not only does this system and its accurate results allow to obtain instant central axis dose distribution for the great majority of clinical situations used throughout the world, it also opens new perspectives in the use of X-ray and cesium-137 at constant focal-center and source-center distances which up till now had been left aside. Moreover, the idea of true scale triangular charts could be used advantageously to other fields such as in betatron

therapy.

3573. Small electron beams in radiation therapy - McGinley P.H., McLaren J.R. and Barnett B.R. - Div. Radiat. Ther., Emory Univ. Clin., Atlanta, Ga. 30322 USA - RADIOLOGY 1979 131/1 (231-234)

The use of lead cutouts to produce small beams in electron therapy results in a reduced dose to the patient. The authors investigated this effect for beams with energies less than 8 MeV and diameters of 3 cm or less. Dose measurements were obtained using film and an ionization chamber. Based on these values, corrections were established to account for dose reduction due to cutout spaces and air spaces between the end of the electron cone and the skin surface. Data were also obtained on the dose increase due to backscattering from internal eyeshields.

3574. A mathematical index of uniformity (IOU) for sensitivity and resolution - Nusynowitz M.L. and Benedetto A.R. - Clin. Invest. Serv., William Beaumont Army Med. Cent., El Paso, Tex. 79920 USA - RADIOLOGY 1979 131/1 (235-241)

The authors define a mathematically precise index of uniformity (IOU) and show that the IOU is a convenient tool to quantitate uniformity of sensitivity and resolution response for any given area of interest on the detector face. They also show that the IOU is an appropriate factor for weighing the mean values of sensitivity and resolution for nonuniformity of response; these weighted sensitivity and resolution factors are used to derive a weighted figure of merit which takes into account, in a single parameter, the nonuniformities of response inherent in the determination of sensitivity and resolution.

3575. Relative determination of W-values for alpha particles in tissue-equivalent and other gases - Krieger G.L., Baum J.W., Varma M.N. and Beach J.L. - Hlth. Phys. Serv., Searle Diagn., Des Plaines, Ill. 60018 USA - PHYS. MED. BIOL. 1979 24/2 (286-298) - summ in GERM, FREN

W (the average energy to form an ion pair) for 5.4 MeV ^{241}Am alpha particles in a Rossi-type tissue-equivalent (TE) gas, argon and methane was determined to an accuracy better than 0.2% using a new automated data handling system. A vibrating reed electrometer and current digitiser were used to measure the current produced by completely stopping the alpha particles in a large cylindrical ionisation chamber. A multichannel analyser, operating in a slow multiscaler mode, was used to store pulses from the current digitiser. The dwell time, of the order of 60 min per channel, was selected with an external timer gate. Current measurements were made at reduced pressures (200 Torr) to reduce ion recombination. The average current, over many repeated measurements, was compared to the current produced in nitrogen and its previously published W-value of 36.39 ± 0.04 eV per ion pair. The resulting W-values were in eV per ion pair, 26.39 ± 0.04 eV per ion pair. The resulting W-values were, in eV per ion pair, 26.29 ± 0.05 for argon, 29.08 ± 0.03 for methane and 30.72 ± 0.04 for TE gas, which had an analysed composition of 64.6% methane, 32.4% CO_2 and 2.7% nitrogen. Although the methane

and argon values agree within 0.1% with previously published values, the value for TE is 1.2% lower than the single previously reported value.

3576. Development of apparatus to measure calcium changes in the forearm and spine by neutron activation analysis using Californium-252 - Smith M.A. and Tothill P. - Dept. Med. Phys. Med. Engin., West. Gen. Hosp., Edinburgh EH4 2XU GBR - PHYS. MED. BIOL. 1979 24/2 (319-329) - summ in GERM, FREN

Techniques were developed to measure small changes of calcium in the forearm and spine in vivo by neutron activation analysis using two sources of ^{252}Cf in a hospital environment. Using purpose-built part-body counters and bilateral irradiation with 7.5 cm premoderation between the sources and the bone, peripheral bone was measured with a total source strength eventually as low as 50 mCi. Two methods of spectral analysis were used and compared. Patient studies of the forearm were successfully undertaken, with a precision of 2.6% which included patient movement, and an annual bone dose of less than 10 rem and skin dose of 35 rem from six measurements. Two 100 mCi sources were used for measurements of the lumbar spine. Care was taken to minimise the problems of non-uniformity of activation which are present using unilateral irradiation. Emphasis was placed on measuring the bodies of the vertebrae with adequate sensitivity and uniformity, and the spinous processes and arches with low sensitivity. A whole counter was used for the bilateral detection of the induced activity. The precision of the method was 3.0% with an annual peak bone dose of 2.1 rem and skin dose of 18 rem from three measurements.

5.14.7. Neutrons

3577. The use of activated aluminium foils for determination of fast neutron contaminations in photon beams - Gur D., Bukovitz A.G., Rosen J.C. and Holmes B.G. - Dept. Radiat. Hlth, Grad. Sch. Publ. Hlth, Univ. Pittsburgh, Pa. 15261 USA - PHYS. MED. BIOL. 1978 23/6 (1183-1185)

The growing interest in the magnitude of neutron contamination in high energy X-ray beams produced by medical accelerators has motivated various studies on this matter in recent years. It is the purpose of this note to report on an evaluation of the sensitivity of the method by which activated aluminium foils are used to determine fast neutron contamination in photon beams in the 20 MV range. In spite of its relatively high threshold, the use of activated aluminium foils is a reliable method for determination of fast neutron contamination from medical accelerators operated in the 20 MV range.

3578. A new portable alpha survey instrument - Wolf M.A. and Umbarger C.J. - Los Alamos Sci. Lab., Los Alamos, N.M. 87545 USA - HEALTH PHYS. 1979 36/1 (60-63)

By use of a pulser-compensating multichannel analyzer and by replacing the pulser with a ^{148}Gd source surrounding the sample source, we have been able to totally stabilize an alpha spectrometry system against spectral drift. Although there is a practical

limit to the ability of this stabilization process to compensate for drifts, all but major system component failures are corrected by this process.

3579. Shielding for neutron radiotherapy sources created by the Be(d,n) reaction - Smathers J.B., Graves R.G., Wilson W.B. et al. - Bioengin. Div., Texas A&M Univ., College Station, Tex. 77843 USA - HEALTH PHYS. 1978 35/6 (807-816)

Shielding data for neutrons produced by the Be(d,n) reaction at deuteron energies of 16, 30 and 50 MeV are presented. This information includes narrow beam and broad beam total kerma attenuation coefficients, an examination of the benefits of laminated shields, and a discussion of the design basis for the therapy shield and collimators used at the Texas A&M Variable Energy Cyclotron. The effectiveness of this clinical shield is discussed.

3580. A versatile variable anthropomorphic phantom - Oxby C.B. and Brooks K. - Dept. Med. Phys., Univ. Leeds GBR - PHYS. MED. BIOL. 1979 24/2 (440-442)

The technique of neutron activation analysis has recently been applied in vivo to subjects suffering from a variety of diseases to determine the total amounts of some of the bulk elements in their bodies, O, N, P, Na, Cl and Ca. The spectrum from the detectors measuring the gamma radiation of an irradiated subject is analysed into the separate activities produced from these elements. The magnitude of each is then compared with those similarly irradiated anthropomorphic phantoms containing known amounts of the elements in aqueous solution. It is essential that the phantom used for the comparison of the induced activities from a particular patient matches him in both size and shape because both the incident neutrons and the resultant emanating gamma rays are attenuated in fluence and energy as they pass through tissue. We therefore devised a variable phantom whose size and shape could be conveniently varied to embrace the range of the dimensions of our patients.

5.14.9. Sound

3581. Color coded ultrasonic differential velocity arterial scanner (Echoflow) - Curry G.R. and White D.N. - Kingston Gen. Hosp., Kingston, Ont. CAN - ULTRASOUND MED. BIOL. 1978 4/1 (27-35)

A scanning system is described which is capable of making a 2 dimensional display of the blood flowing in arteries. It has been especially designed for display of the carotid bifurcation but can be adapted for other blood vessels. Normally it uses continuously generated energy and detects the Doppler shifted signals from the blood flowing in the arteries at peak velocity as the arterial pulse propagates through the segment of vessel being scanned. The system is directional so that flow in only a single direction with reference to the beam is displayed at any one time. The Doppler shifted signals reflected by the blood flowing at peak velocity are detected by filters with varying frequency ranges. Signals from each filter activated are color-coded. The color display is made from the filter activated by the highest Doppler frequency shifted signals. Thus the

arteries are displayed by colors corresponding to the highest peak velocities in their segments. Stenotic areas where peak velocities will be greater than in non-stenosed regions will thus be displayed by colors differing from that used to represent normal peak velocities. These regions of increased peak velocities correlate reliably in 95% of cases with arterial stenoses occluding more than 74% of the arterial diameter. Occluded vessels which do not appear at their appropriate position on the image are also reliably displayed in 95% of cases. The display of normal carotid bifurcations by normal colors in the Doppler scan is also reliable in 93% of cases but the display of slightly increased velocities may result from hemodynamic causes as often as from localized small stenoses.

3582. Real-time wide-angle sector echocardiography: Atrioventricular canal defects - Hagler D.J., Tajik A.J., Seward J.B. et al. - Mayo Clin. Mayo Found., Rochester, Minn. 55901 USA - CIRCULATION 1979 59/1 (140-150)

Real-time 80° phased-array two-dimensional sector echocardiography was used in 44 patients with atrioventricular (AV) canal defect. Anatomic details were surgically confirmed in 33. The apex view allowed visualization of atrial and ventricular portions of complete AV canal defects, with the common AV valve structures between the defects. The apex view also allowed us to differentiate divided and undivided, attached and free-floating common anterior valve leaflets to distinguish types A, B, and C complete AV canal defects. With the apex view, the ostium primum atrial septal defect and the attachment of the AV valve to the crest of the ventricular septum were observed in partial AV canal defect. Short-axis views revealed the cleft in the anterior leaflet of the mitral valve. The rapid and precise definition of anatomic details by this method has eliminated many of the difficulties in diagnosing this defect by M-mode echocardiography.

3583. Blood cell banding in ultrasonic standing wave fields: A physical analysis - Ter Haar G. and Wyard S.J. - Phys. Dept., Guy's Hosp. Med. Sch., London SE1 GBR - ULTRASOUND MED. BIOL. 1978 4/2 (111-123)

Blood cell flow can be arrested in living tissue by exposing the blood vessels to ultrasound in a stationary wave field. The cells form into bands at half wavelength intervals in the blood vessels. This phenomenon is described, and the forces that may be involved are discussed. The forces considered include standing wave radiation pressure, inter-cellular forces and Oseen forces. A computer model is described and the computed trajectories of cells under the action of these forces are shown.

3584. Circulatory effect of jet noise, with special reference to cerebral circulation - Miyazaki M. - Dept. Int. Med., Kosai-in Hosp., Suita City, Osaka JPN - JPN. CIRC. J. 1978 42/9 (1019-1024)

The circulatory effect of jet noise on heart rate, systolic blood pressure and cerebral blood flow was investigated by means of the on-line Doppler ultrasonic technique devised by the author in 20

normal young males, normal elderly males and elderly patients with cerebral vascular disease. The jet noise ranged from 60 dBA to 110 dBA. Heart rate and systolic blood pressure showed slight and transient increase at the level of over 90 dBA. Although the cerebral blood flow was increased at the level of 90-110 dBA, conspicuous dissociation was observed between the vertebral artery and internal carotid artery. The vertebral artery dominant type was more frequent than the internal carotid artery dominant type. Headache and discomfort due to the noise were observed in all the subjects. The above facts suggest that the jet noise induces dysfunction of the autonomic nervous system and various kinds of psychosomatic diseases.

3585. Patient data displaying attachment for the Bronson-Turner ophthalmic contact B-scan ultrasonoscope - Buettner H. - Dept. Ophthalmol., Mayo Clin., Rochester, Minn. 55901 USA - AM. J. OPHTHALMOL. 1979 87/4 (570-571)

A numerical light-emitting diode data displaying attachment designed for the Bronson-Turner Ophthalmic Contact B-Scan Ultrasonoscope provides the following information: patient's identification number, date of the examination, eye examined, position of the transducer probe, and decibel setting. The light-emitting diodes are placed over the upper border of the display screen and appear automatically on all photographs of the ultrasonic display.

3586. Pelvic endometriosis as demonstrated by gray scale ultrasound - Hankins A.J. Jr., Goodwin W.P., Ervin C.W. and Mitchell D.P. - Dept. Radiol., Southwest Detroit Hosp., Detroit, Mich. 48216 USA - J. NAT. MED. ASSOC. 1979 71/3 (289-290)

Six cases of pelvic endometriodosis are discussed and their ultrasonic appearances presented. The literature is reviewed concerning the ultrasonic appearance of pelvic endometriosis. The clinical significance of endometriosis in the differential diagnosis of females with pelvic pain is stressed. In this series endometriosis could not be differentiated from cystic lesions of the ovaries and from pelvic inflammatory disease ultrasonically. Other confirmatory measures or studies such as laparoscopy and biopsy were usually needed.

3587. Electronic sector-scanning cross-sectional echocardiograph, model SSH-10A. High-resolution two-dimensional real-time sector-scanning ultrasonic image system for heart diagnosis - Sato S., Akutsu F. and Takemura Y. JPN - TOSHIBA REV. 1979 NO. 119 (20-24)

The electronic sector-scanning ultrasonic diagnostic equipment SSH-10A, presented in this paper, is considered to be very useful clinically because of the ease of manipulation, high-quality image, real-time image of pulsating heart, and added features of various other heart diagnostic methods. However, in order to obtain still better ultrasonic tomograms, the authors consider it necessary to improve the image quality and resolution in particular.

3588. Angular response of piezoelectric elements in phased array ultrasound scanners - Smith S.W., Von

Ramm O.T., Haran M.E. and Thurstone F.L. - Food Drug Adm., Bur. Radiol. Hlth, Rockville, Md. 20857 USA - IEEE TRANS. SONICS ULTRASON. 1979 26/3 (185-191)

In the design of phased linear array sector scanners for medical applications, it is important to preserve uniform response at each angle throughout the sector scan of $\pm 45^\circ$. Examination of linear array transducers showed reduced transmit pressure and receive sensitivity at angles beyond $\pm 20^\circ$ by individual array elements. The angular response of piezoelectric elements, many wavelengths long and approximately one wavelength or less in width, do not agree with the predictions of simple diffraction theory for plane apertures. Continuous wave (CW) angular response measurements using the RCA Ultrasonovision of individual piezoelectric elements 0.6λ to 2λ wide indicated this behavior was independent of inter-element coupling and pulse excitation effects within a linear array transducer. Spectral analysis of isolated elements showed a significant amount of energy coupled into the transverse mode due to the small aspect ratio of width to thickness dimensions of the piezoelectric elements. A first-order two-dimensional numerical model, based on thickness mode and transverse mode vibrations, resulted in angular response functions which agree well with experimental measurements.

6. SPECIALIZED INSTRUMENTATION

3589. Use of plastic isolators in the prevention of infection in high risk patients with blood diseases (Fren) - EMPLOI DES ISOLATEURS PLASTIQUES DANS LA PREVENTION DE L'INFECTION CHEZ LES MALADES HEMATOLOGIQUES A HAUT RISQUE INFECTIEUX - Bergerat J.P., Giunta M., Boilletot A. et al. - Serv. Mal. Sang, CHU, Hop. Civ., 67005 Strasbourg Cedex FRA - SEM. HOP. 1978 54/37-40 (1137-1143) - summ in ENGL

The authors report a microbiological study of the flora of high risk adults with blood diseases isolated in a hermetically sealed plastic isolator. This type of isolation is very effective in the prevention of infections due to hospital germs as such contamination occurred only twice in 292 days isolation and was found in only 0.8% of samples. The efficacy of methods of body decontamination and the incidence of infective complications in the series is also reported.

3590. Soft tissue stretching with magnets - Engel J. and Dagan J. - Chiam Sheba Med. Cent., Tel Hashomer ISR - HAND 1978 10/3 (312-316)

Various clinical conditions require soft tissue elongation that can later host a bone graft. The possibility of stretching the soft tissues by magnetic force was tested on the forearm of dogs. The results are encouraging, provided certain precautions are taken and the pull exerted is not too great.

3591. A new guinea-pig watering system - Sommers T. and Betts T.E. - Res. Lab., Brompton Hosp., London SW3 6HP GBR - LAB. ANIM. 1978 12/3 (163-164)

Automatic drinking valves were mounted outside solid-floor cages, the guinea-pigs gaining access to

them through holes in the cage walls. The animals were thus provided with a constant supply of clean water without the danger of their cages being flooded.

3592. Monitoring and recording clinical trials - Glaser R.D., Wallace C. and Bass S.W. - Glaser, Glaser Ass., West Redding, Conn. USA - MED. INSTRUM. 1979 13/2 (109-112)

A procedure based on the use of on-site monitoring has been developed for managing clinical testing programs. The procedure involves orientation meetings, forms specifically designed for good record keeping, staff instruction, the establishment of normal laboratory values and criteria for patient selection, and prescribed monitoring functions. This procedure has proved successful in improving the performance of the physician investigator, maintaining investigator interest, and enhancing the value of program results.

6.2. Thermoregulation

3593. Measurement of diurnal core temperatures of rats in operant cages by AM telemetry - Thornhill J.A., Hirst M. and Gowdey C.W. - Dept. Pharmacol., Univ. West. Ontario, London N6A 5C1 CAN - CAN. J. PHYSIOL. PHARMACOL. 1978 56/6 (1047-1050) - summ in FREN

A special AM telemetric system of recording core temperature was developed for rats working in individual, adjacent operant conditioning chambers within a sound-attenuated room. The system monitored core temperatures of each rat continuously and recorded them, in degrees Celsius, every 30 min so that diurnal patterns and fluctuations after saline or drug injections could be determined. Periodic comparisons showed close agreement with temperatures recorded by a rectal probe.

3594. A physiologically compatible tissue-equivalent liquid bolus for microwave heating of tissues - Hand J.W., Robinson J.E., Swarnowski S. et al. - MRC Cyclotron Unit, Hammersmith Hosp., London W12 OHS GBR - PHYS. MED. BIOL. 1979 24/2 (426-431)

This technique uses a physiologically compatible and microwave tissue-equivalent bolus system to provide efficient microwave coupling to irregularly shaped tissues without adversely affecting those tissues. The technique minimises shape and size dependence of microwave energy absorption. In addition by maintaining the temperature of the bolus near target temperature, the thermal uniformity may be much improved over that obtained by simply exposing the irregularly shaped tissue to microwaves in air. Such an approach should be useful in developing uniform heating of small laboratory animals. Furthermore, the liquid bolus could be used in direct contact with the skin in treatments involving microwave heating of superficial lesions in human patients, and would allow the transformation of the complex shapes of treated areas into ones of simple plane geometry. The effective depth of penetration of the microwaves could be increased by using a refrigerated bolus to maintain a patient's skin and superficial tissue at a controlled and reduced temperature.

6.3. Digestive tract

3595. Duodenal pressure activity recorded by an intraluminal electrical transducer in man - Osnes M., Larsen S. and Myren J. - Dept. Gastroenterol., Ulleval Hosp., Oslo NOR - SCAND. J. GASTROENTEROL. 1978 13/8 (999-1005)

The duodenal pressure activity was studied by means of an intraluminal electrical transducer, and the recordings were compared to those of a traditional open-tip tube. The physiological significance of different pressure waves was studied by means of combined pressure and cineradiographic recordings. The recordings obtained by the intraluminal transducer were found to be essentially similar to those obtained by the open-tip tube. Most pressure waves observed in this study were found to cause a propulsive, mixed, or retropulsive movement of the intraluminal contents, and no significant displacement of the contents could be observed without simultaneous pressure waves. A difference in physiological significance of single and complex waves could not be detected. Rhythmic activity caused a rapid propulsion of intraluminal contents. It is concluded that the pressure recordings obtained by the intraluminal transducer are reliable in the study of duodenal motility.

3596. Combined manometric-pH recording catheter for esophageal function tests - Orringer M.B., Lee R. and Sloan H. - Sect. Thorac. Surg., Dept. Surg., Univ. Michigan Med. Cent., Ann Arbor, Mich. 48109 USA - ANN. THORAC. SURG. 1978 26/6 (581-585)

A combined manometric-pH recording catheter for performance of esophageal function tests is described. This combined unit has been used successfully in more than 300 patients. It has the advantages of (1) eliminating the need for introduction of two separate recording catheters into the esophagus and (2) permitting simultaneous dynamic recordings of intraesophageal pressures and pH in assessing competence of the distal esophageal high-pressure zone.

3597. Automatic recording of caecotrophy in the rabbit - Jilge B. - Zent. Tievers. Anlage, Univ. Ulm, D-7900 Ulm GFR - LAB. ANIM. 1978 12/1 (19-20)

A mechanical and electronic unit that records circadian faecal excretion by rabbits is described.

3598. Holographic determination of rigid-body motions, and application of the method to orthodontics - Pryputniewicz R.J. - Orthodont. Dept., Univ. Connecticut Hlth Cent., Sch. Dent. Med., Farmington, Conn. 06032 USA - APPL. OPT. 1979 18/9 (1442-1444)

A method for holographic determination of rigid-body motions is presented. In the calculations, parameters characterizing three or more arbitrarily chosen points on the object are used to evaluate translations and rotations, which, in turn, are entered in subsequent analysis of relative motions of deformed points on the object. This method finds particular applications in studies of orthodontic tooth movement.

3599. Intraoperative autotransfusion with the Bentley ATS-100 - Klebanoff G. - Dept. Surg., North East. Ohio Univ. Coll. Med., Youngstown, Ohio 44510 USA - SURGERY 1978 84/5 (708-712)

Intraoperative autotransfusion is coming of age in modern surgery and is finding its place in the armamentarium of several surgical disciplines. Presently the standard for the industry is the Bentley ATS-100 or ATS-200 which have more than amply demonstrated the safety of the procedure, if used properly. In the future one can anticipate improvement of these units and the introduction of other methods by which blood may be salvaged safely intraoperatively, processed, and reinfused as needed.

6.6. Lymphatic system

3600. Analysis of lymphatic protein flux data III. Use of the nonlinear flux equation to estimate σ and PS - Brace R.A., Granger D.N. and Taylor A.E. - Dept. Physiol., Marshall Univ., Huntington, W.Va. 25701 USA - MICROVASC. RES. 1978 16/3 (297-303)

This paper introduces the use of the nonlinear or exact flux equation for determining estimates of the solvent drag reflection coefficient ($\sigma(f)$) and the permeability-surface area product (PS) of the capillary membrane from lymphatic protein and fluid flux rates. In the past, a linearized version of the nonlinear flux equation has been used; however use of the linear equation has been problematic since there are a variety of definitions for C, the average protein concentration in the pore. The benefits of the exact equation in comparison with the linear equation are that (1) it more closely represents the physical processes occurring as the solute crosses the membrane, and (2) it eliminates the long standing problem with defining C. In general, the value of $\sigma(f)$ determined with the exact flux equation is closer to one than those found with the most frequently used form of the linear flux equation.

6.7. Circulation

3601. Apparatus ('velomed') giving reproducible results in cardiovascular endurance training (Germ) - DAS VELOMED ALS TRAININGS- UND TESTGERAT FÜR REPRODUZIERBARE ERGEBNISSE IM HERZ-KREISLAUF-AUSDAUERTRAINING - Budzisch H.H., Siewert H., Eichhorst E. and Anders G. - II Med. Klin., Ber. Med. Med., Humboldt Univ., Berlin DDR - MED. SPORT (BERLIN) 1978 18/8 (249-251) - summ in RUSS, ENGL

It can be stated that the Velomed bicycle ergometer will be suited for spare time and recreational sports in the GDR, if the suggested modifications of the braking system are realized. The performance achieved at the single adjustments are presented in tabular form. They are largely reproducible and may be considered to be reference values for all modified Velomed bicycle ergometers.

3602. Stable postoperative phase after total artificial heart-replacement in animal-experiments (Germ) - DIE

STABILE POSTOPERATIVE PHASE: ERREICHBARES ZIEL NACH KUNSTLICHEM TOTAL-HERZERSATZ IM TIEREXPERIMENT - Schiessler A., Kless H., Unger V. et al. - Chir. Klin., Freie Univ., Berlin GFR - LANGENBECKS ARCH. CHIR. 1978 346/3 (209-217) - summ in ENGL

Presented are results of an analysis of more than 30 000 data which were sampled in seven long-surviving calves after total artificial heart-replacement (more than 35 days survival). The continuity of 24 types of data (hemodynamic, labor- and physical data) are transformed for every animal in time-equidistant datafields and after this an average continuity for all seven animals is calculated and plotted. 20 Days after the operation the data have reached the preoperative values in nearly all cases, indicating a stable phase starting, according to the clinical condition of the animals.

3603. Serial exercise ECG tests - de Lang P.A., Mattart A.V.J., Distelbrink C.A. et al. - Dept. Cardiol., St Laurentius Hosp., Roermond NLD - PROG. REP. MED. FYS. INST. TNO 1978 No. 6 (127-132)

Some aspects and results of repeated electrocardiographic exercise tests on the same person are described, using two application areas as examples: screening and medication evaluation. Starting in 1973 in Vlagtwedde and in 1976 in Vlaardingen during an epidemiological study on groups of about 100 male persons, those participants who were considered to have coronary angina pectoris (AP) according to a cardiac questionnaire were selected for exercise testing. The first results of computer interpretation of these exercise tests show an increase in the diagnostic sensitivity compared with the results obtained by visual analysis. In a comparative drug study of patients with chronic AP, the therapeutic effect of two beta-blocking agents was described by trend analysis of 5 consecutive exercise ECG's recorded during a period of 6 weeks.

3604. An implementation of the Penaz method for measuring arterial blood pressure in the finger and first results of an evaluation - Wesseling K.H., de Wit B., Snoeck B. et al. NLD - PROG. REP. MED. FYS. INST. TNO 1978 No. 6 (168-173)

An instrument for the noninvasive, semicontinuous, calibrated measurement of the arterial blood pressure wave form in the finger based on the original of Penaz in Czechoslovakia has been developed. The hydrodynamic and physiological bases of the operation of the instrument have been investigated in this study, i.e., that cuff pressure will equal the arterial pressure in the finger if the arterial transmural pressure is zero. Several 'lock-on' procedures which rely on the output signal of a photoplethysmograph located in the middle under the cuff are described. A first evaluation in ten normal subjects, in which Riva-Rocci Korotkov blood pressures are compared with the finger blood pressure of the instrument, shows that the mean absolute error between the methods is 11 mmHg (1.5 kPa). Neither the systolic nor the diastolic pressure levels differ significantly in their means ($p=0.2$).

3605. A 2 MS rise time unidirectional hydraulic valve -

Wesseling K.H., Westerhof N. and Sipkema P. - Dept. Physiol., Free Univ., Amsterdam NLD - PROG. REP. MED. FYS. INST. TNO 1978 No. 6 (229-231)

A rapidly opening hydraulic valve was constructed using design principles taken from cardiac valves. The valve was tested in a time-domain-reflectometry set-up. Due to frequency response limitations imposed by the catheter-manometer system, a lower limit of about 2 ms for valve opening time was established.

3606. Application of Womersley's method to the measurement of blood flow in extracorporeal circulation (Fren) - APPLICATION DE LA METHODE DE WOMERSLEY A LA MESURE DU DEBIT DANS UNE CIRCULATION EXTRACORPORELLE - Ly D.P., Boyer P., Barthelemy R. and Vives M. - Groupe Rheol., Inst. Mecan. Fluides, 31071 Toulouse Cedex FRA - J. FR. BIOPHYS. MED. NUCL. 1978 2/4 (209-211) - summ in ENGL

In the practice of cardiac surgery, the measurement of pressures is a commonly used technique. The suggested method consists in the inference of the values of the instantaneous flow rates from the measurements of a pressure gradient: two pressure transducers put on a circular cylindrical straight branch of the extracorporeal circulation are distant enough to accurately determine the axial pressure gradient. The Fourier series for the time function pressure gradient is used to calculate the different instantaneous flow rates which depend on the continuous component, the fundamental $\delta p/\delta z$ and its first harmonics, applying every function of Womersley's theory. An automatic addition of these different flow rates leads to the value of the total instantaneous flow rate. The results obtained by this method are compared with those given by the classic electromagnetic flowmeter. The results are concordant. A sufficiently elaborated automation as well as flexibility of its use will render it very efficient.

3607. A new vascular shunt catheter (Fren) - UNE NOUVELLE SONDE VASCULAIRE SHUNT - Guiset J. and Lagache G. - CAE 3e Est CHU, F 59000 Lille FRA - NOUV. PRESSE MED. 1979 8/2 (125-126) - summ in ENGL

For over 10 years, many authors have attempted to obtain vascular exclusion by intubation with rigid catheters: rubber tube, Argyle is catheter, special catheters with 1, 2 or several full balloons. Owing to this rigidity, introduction is difficult and this calibre of the catheter is limited, with reduction of the flow. The authors have developed a supple multitoric catheter which takes on its final form only at the desired site, at the time of inflation.

3608. Serial myocardial biopsies using an improved microfluorometric assay - Holland C.E., Feinberg H., Levitsky S. et al. - Dept. Pharmacol., Sch. Basic Med. Sci., Univ. Illinois Coll. Med., Chicago, Ill. 60680 USA - J. SURG. RES. 1978 25/4 (342-348)

Myocardial biochemical and physiologic parameters should be obtained simultaneously from the same subject for optimum correlation. However, removal of myocardial biopsies sufficient for numerous biochemical analyses may compromise the cardiac

function to such an extent that subsequent physiologic measurements are of dubious value. Previously, to prevent alterations of physiologic parameters, only terminal specimens or extremely small biopsies were taken for biomedical analysis. This paper describes methodology for repeatedly obtaining microbiopsies which does not produce a significant alteration in cardiac function. In addition, the authors present procedures for homogenization, extraction, and semiautomated fluorometric analysis of the microbiopsies for high-energy phosphates.

3609. Arterial blood pressure waveform simulator - Putnam J.R. and Gleason C.A. - Med. Instrument. Dept., Mt Zion Hosp., San Francisco, Calif. USA - J. CLIN. ENG. 1978 3/4 (373-375)

This paper describes an arterial blood pressure waveform simulator which can allow a hospital staff member to check quickly, inexpensively, and accurately for proper blood pressure amplifier operation. The simulator can be constructed by the biomedical engineering staff in one day for less than fifty dollars. After the balanced and calibrated simulator is connected to the blood pressure amplifier input, the simulator will generate an arterial pressure waveform with a 120 mm Hg systolic pressure, 80 mm Hg diastolic pressure, 95 mm Hg mean pressure, and a dichrotic notch

3610. Laser Doppler microscope in an oblique-backward mode and pulsatile blood flow velocity in pulmonary arteriole - Koyama T., Horimoto M., Mishina H. et al. - Res. Inst. Appl. Electr., Hokkaido Univ., Sapporo JPN - EXPERIENTIA 1979 35/1 (65-67)

Blood flow velocity, pulsatile in correspondence to cardiac event, in pulmonary arterioles of anesthetized bullfrogs could be measured on lung surfaces covered with a water-containing plastic disc by means of a laser Doppler microscope arranged in an oblique-backward mode.

3611. An automatic cardiac action potential duration meter - Lab M.J. and Child R.K. - Dept. Physiol., Charing Cross Hosp. Med. Sch., London W6 8RF GBR - AM. J. PHYSIOL. HEART CIR. PHYSIOL. 1979 5/1 (H183-H188)

The duration of a cardiac action potential (AP) is measured from the beginning of its upstroke to the end of its asymptotic repolarization phase: the end being given by a point in proportion to the AP amplitude. If the resting potential, AP amplitude, as well as the duration, alter simultaneously, frequent accurate measurements can be extremely tedious. A fully automatic AP duration meter thus has been constructed to cope with these difficulties while measuring within about 2% on a beat-to-beat basis. It is suitable either for brief sampling of AP durations when recording with microelectrodes, which may impale cells intermittently, or for continuous monitoring, as with suction electrodes on intact beating hearts in situ. For example, the device can faithfully track changes in duration during periods of regional myocardial ischemia in intact ventricles in situ while the AP alters its base line, upstroke velocity, amplitude, and duration.

3612. A modified clamp for repair of aortic aneurysm and aortic dissection - Davis Z. - Dept. Thorac. Cardiovasc. Surg., Wayne State Univ., Detroit, Mich. 48201 USA - ANN. THORAC. SURG. 1979 27/2 (183-184)

Pilling aortic clamp, modified to make the approach to aortic aneurysm and aortic dissection repair more versatile, is described.

3613. The porous endocardial electrode - Amundson D.C., McArthur W. and Mosharafa M. - Card. Pacemakers, Inc., St Paul, Minn. USA - PACE 1979 2/1 (40-50)

The permanent endocardial electrode has exhibited the problems of dislodgement, excessive threshold rises and loss of sensing. These failure modes are addressed with a new electrode incorporating a porous body of Pr-Ir fibers with a fiber diameter of 20 μ m and an overall density of 10%. Porous electrodes have the advantages of utilizing the electrode interior both for tissue ingrowth to improve anchoring and for electrolyte penetration which improves R wave amplitude and reduces polarization losses. A series of 20 porous electrodes was compared with 17 solid electrodes of similar dimension. Electrodes were implanted in dogs in the apex of the right ventricle, and were subsequently followed up to 210 days. Comparison of the electrode data revealed that the porous electrodes had a 40% reduction in chronic voltage thresholds and had an overall dislodgement rate of 10%, compared to 53% for the solid electrodes. Histological examination revealed tissue ingrowth throughout the electrode interior and a fibrotic capsule about half the thickness of the solid electrodes. R wave stability was enhanced with the porous electrode due to improved anchoring, reduction in slew rate changes and less R wave attenuation. Assuming results are translatable to humans, the porous electrode will provide a greater pacing safety margin when used with a standard demand pacemaker, or improved longevity with the same safety margin as solid electrodes if used with a programmable pacemaker. The incidence of dislodgement and sensing failure will also be diminished with the porous electrode.

3614. Pacing failure due to an unusual fracture of the sutureless myocardial electrode - Khair G.Z. and Tristani F.E. - Cardiovasc. Sect., Med. Serv., VA Cent., Wood, Wis. USA - PACE 1979 2/1 (51-54)

A 64-year-old man had an epicardial demand pacemaker implanted for treatment of Mobitz type II heart block. Two sutureless myocardial electrodes were inserted, but a unipolar system was used based on stimulation threshold and sensitivity measurements. Fourteen months later the patient presented with pacing failure caused by a fracture of the corkscrew electrode with wide separation of the broken ends. The pacemaker, however, continued to inhibit satisfactorily. Pacing was successfully reestablished employing the second available lead. To our knowledge, there has been no publication reporting this type of failure of the sutureless myocardial electrode.

3615. The autodiagnostic pacemaker - Auerbach A.A.

and Furman S. - Dept. Neurosci., Albert Einstein Coll. Med., Bronx, N.Y. USA - PACE 1979 2/1 (58-68)

Loss of normal pacemaker stimulation and/or sensing functions requires prompt detection, automatic correction and automatic and continuous 'marking' of the intermittent failure. The autodiagnostic pacemaker (ADP) detects 'failure to capture' (FC) by distinguishing, at its single stimulating and sensing electrode, between the normal biphasic cardiac response evoked by an adequate stimulus (corresponding to the QRS and T waves on the surface cardiogram) and the monophasic pseudoresponse generated by electrotonic spread of a subthreshold stimulating current. Detection of 'failure to sense' (FS) spontaneous cardiac activity requires two amplifiers: a 'timing control' amplifier of standard fidelity and standard (approximately 250 ms) refractory period, and a second amplifier which has negligible refractoriness and provides high fidelity amplification of all evoked and spontaneous activity. Failure to sense (FS) is defined as a specified number of consecutive failures to recycle correctly the pacemaker's timing circuits. Similarly, a specified number of consecutive failures of the stimulus to evoke an active cardiac response is defined as a failure to capture (FC). When FC is detected, the ADP doubles the applied stimulus voltage and generates marker pulses which follow every subsequent stimulus by 40 ms. The marker pulses appear on the surface electrocardiogram, serving as an externally detectable 'memory' of the earlier, possibly corrected, failure. When FS is detected, non-stimulating marker pulses, of a different time relation (80 ms delay) to each stimulus, are generated continually and can also be detected externally. The ADP has been tested in 14 anesthetized, open-chest dogs. Unipolar rather than bipolar electrodes were used as they provided more reliable stimulation and more satisfactory electrograms for detection.

3616. Determination and importance of the magnification factor in the calculation of ventricular volume: Development of a simple, accurate method - Cascade P.N., Wajszczuk W.J., Kerin N.Z. et al. - Sect. Diagn. Radiol., Dept. Radiol., Sinai Hosp., Detroit, Mich. 48235 USA - CATHETER. CARDIOVASC. DIAGN. 1978 4/4 (391-398)

A study of single-plane right anterior oblique left ventricular angiography was undertaken to determine the importance of obtaining correct positioning of a magnification grid and to develop a simple but accurate technique to minimize magnification errors. Theoretical and experimental volume determinations demonstrated 3% to 28% volume errors for grid placement errors ranging from 1 centimeter to 5 centimeters. An experiment was designed whereby cross table lateral radiographs of the chest were taken during contrast injections of the left ventricle. The relative position of the left ventricular center was found at a point 66% of the distance from the anterior to the posterior margin of the heart. Finding this point on noncontrast lateral films of the chest for positioning of a square centimeter grid should yield a more accurate determination of the magnification factor than other current empiric methods.

3617. Negative contrast echocardiography: A new method for detecting left-to-right shunts - Weyman A.E., Wann L.S., Caldwell R.L. et al. - Krannert Inst. Cardiol., Indianapolis, Ind. USA - CIRCULATION 1979 59/3 (498-505)

Cross sectional echocardiographic visualization of the interatrial septum in both normal persons and patients with atrial septal defects has been reported. Although septal defects can generally be visualized, false positives are frequently encountered. This study evaluated whether visualizing the patterns of contrast flow in the region of an apparent atrial septal defect by cross sectional echocardiography could aid in the differentiation of true defects from false positives. We studied 25 patients - 13 with intact interatrial septa and 12 with atrial septal defects. Contrast was visualized in the right atrium in 24 of 25 patients (all 13 normal patients, and 11 of 12 patients with atrial septal defects). In all patients with intact interatrial septum, the peripherally injected contrast material homogeneously filled the right atrium, delineating the position and integrity of the interatrial septum. In two of 11 patients with atrial septal defects, evidence of right to left shunting through the defect confirmed its presence. In the remaining nine patients, the flow of blood from left atrium to right atrium, following the path of the left to right shunt, produced an echo free area along the right margin of the interatrial septum, or an area of negative contrast. This phenomenon was produced by the non contrast containing blood flowing through the septum and displacing the contrast containing blood from along the right hand portion of the septum. This study suggests that peripheral injection of echocardiographic contrast material may be of value in detecting atrial septal defects in patients with predominant left to right shunting when contrast flows are evaluated using cross sectional echocardiography.

3618. Interference with cardiac pacemakers by diathermy tested in various simulation models (Germ) - STORBEEINFLUSSUNG VON HERZSCHRITTMACHERN DURCH DIATHERMIE, GEMESSEN AN VERSCHIEDENEN STIMULATIONSMODELLEN - Gebhardt U. and Irnich W. - Abt. Inn. Med., I Med. Fak., RWTH Aachen GFR - BIOMED. TECH. 1979 24/1-2 (10-16) - summ in ENGL

The assessment as to how susceptible pacemakers are to interference by electromagnetic fields is based on a test method recommended by the Association for the Advancement of Medical Instrumentation. This simulation model, however, needs to be investigated. This paper presents a simulation model which may be understood as representing a 'worst case' situation. A series of measurements made in diathermal fields reveals the differences between the simulation models. It has been found that pacemakers are greatly influenced by diathermal fields in the 27 MHz and the 434 MHz range. In the Gigahertz range (2.45 GHz), however, the pacemakers investigated by us remained uninfluenced, so that this form of therapy is regarded as uncritical provided it is carried out under pulse or ECG monitoring.

3619. Review of anchoring measures of transvenous pacemaker electrode leads (Germ) - UBERSICHT UBER VERANKERBARE TRANSVENOSE SCHRITTMACHERSONDEN - Bisping H.J. - Abt. Inn. Med., I Med. Fak., RWTH Aachen GFR - BIOMED. TECH. 1979 24/1-2 (16-27) - summ in ENGL

The advantages of transvenous endocardial pacing electrodes are often diminished by a high incidence of dislodgement of this type of lead. Thus, in the past few years, various types of fixation mechanism have been developed. Leads intended for atrial implantation require reliable methods of fixation. The mechanical and electrical demands made on an ideal pacemaker lead are high, and some are not readily compatible with others; they must be easily introduced and readily manoeuvred into the desired position within the heart; they must be flexible, fracture proof and resistant to aging processes. Their threshold values should be low and/or their sensed signals high enough to permit synchronization. Today, numerous endocardial leads with various anchoring facilities are available, e.g. leads with flanges, hooks, prongs, jaws and various types of screw or spiral tips. They may be differentiated into traumatic and atraumatic fixation devices requiring different procedures for introduction. Some traumatic leads are provided with an integrated means of protection during the process of introduction into the vein.

3620. Pitfalls in measuring R waves in pacemaker-dependent patients - Widmann W.D., Edoga J.K., Thomas L. et al. - Morristown Mem. Hosp., Morristown, N.J. USA - PACE 1979 2/2 (186-190)

Determination of adequate R wave sensing is an important step in pacemaker electrode implantation and pacemaker replacement operations. In patients who are completely pacemaker dependent, these operations are usually performed with a functional temporary pacemaker in place throughout the testing period. In such patients, there is the special problem of determining whether the test system is sensing the temporary pacemaker spike rather than the resultant QRS voltage. Patients were studied and a laboratory model was created to evaluate the response characteristics of a standard R wave test device. Patients showed two general types of curves as R waves were measured at various output voltages of the temporary pacemaker. Type A responses showed direct correlation between output voltage and measured R waves. Type B responses showed an initial high plateau of R waves followed by an abrupt fall below acceptable values, and then a direct correlation between r waves and output voltage. Laboratory testing revealed that the temporary pacemaker spike, and not the R wave, was being 'sensed' in type A curves, and that the r wave was sensed only in the initial plateau of the Type B curves. This pitfall can lead to acceptance of an unsatisfactory electrode position in some patients and to futile electrode repositioning in others. (PACE, Vol.2, March-April, 1979).

3621. A device for the simulation of cardiac arrhythmias - Schaefer S., Arditti M., Stnkus K. et al. - Dept. Cardiol., Cedars-Sinai Med. Cent., Los Angeles, Calif.

The early and accurate detection of cardiac arrhythmias has been recognized as instrumental in the prevention of sudden death from cardiac disease. In light of this, an arrhythmia detection system utilizing separate atrial and ventricular signals is being developed. As part of this development, an arrhythmia simulator was designed and built to provide controlled pulse outputs representative of most clinically significant arrhythmias. The device consists of two identical pulse generators that can be operated either independently or slaved through a programmable slave circuit. Heart rates from 20 to 600 beats per minute as well as various time relationships between the atrial and ventricular signals are achievable.

6.8. Respiration

3622. Biochemical studies on the mechanism of pulmonary fibrosis. II. Trial manufacture of silica inhalation apparatus and changes of collagen and elastin in experimental pulmonary fibrosis caused by silica inhalation - Masutani M. - I Dept. Int. Med., Nihon Univ. Sch. Med., Tokyo JPN - NIHON UNIV. J. MED. 1978 20/3 (225-254)

As a fundamental study of pulmonary fibrosis, silica inhalation was carried out in experimental animals using a newly constructed apparatus, and the lung connective tissue was analyzed biochemically. The results obtained may be summarized as follows. On completion of inhalation in the apparatus, an Si deposit of up to 0.12% was demonstrated in the dried lung tissue by means of atomic spectral absorption. Abundant Si ions were also detected with an X-ray microanalyzer. In the silica group, the total collagen was found to be increasing at 2 months after the inhalation, and the increase was maintained as time passed. Quantitatively speaking, when the fibrotic tendency was strong, the relatively immature soluble collagen was increased, but later the mature insoluble collagen increased. Concerning amino acid composition, an increase in hydroxyproline and hydroxylysine, which characterize collagen, was noted in the silica group at 4 months, indicating that active biosynthesis of collagen was in progress. It was concluded tentatively that the increase in elastin originated chiefly in aging as well as fibrosis. Elastin obtained by hot alkali treatment abounded in non-polar amino acids, while that obtained by hot trichloroacetic acid treatment also contained fairly large amounts of glutamic acid and aspartic acid. The elastin obtained by the two different methods, respectively, did not differ significantly in amino acid composition between the silica and control groups. Experimental inducement of pulmonary fibrosis was achieved by means of the present method of silica inhalation, but no alveolar proteinosis was observed.

3623. A mechanically actuated wave mattress - Brearley M.N. and Motloch W.M. - Rehab. Engin. Cent., Child. Hosp., Stanford, Calif. USA - PROSTHET. ORTHOT. INT. 1978 2/2 (79-80)

A polio victim who has been in a negative pressure ventilator ('iron lung') since 1950 was in need of an

activated mattress to combat the hallucinatory effects of complete immobilization and to assist with body pressure distribution. A mechanical method was used to give the patient's mattress a moving wave form of vertical amplitude 50 mm with a period variable from 50 sec to infinity. His arms rested on separate supports which oscillated 180 degrees out of phase with the trunk support. The device is powered by a 12 volt electric motor operating through 2 mechanical reduction gear units. It differs significantly in design and purpose from pneumatic ripple mattresses.

3624. Evaluation of a constant-temperature hot-wire anemometer for respiratory-gas-flow measurements - Lundsgaard J.S., Gronlund J. and Einer-Jensen N. - Dept. Physiol., Univ. Odense, DK 5230 Odense DNK MED. BIOL. ENG. COMPUT. 1979 17/2 (211-215)

The performance of a constant-temperature hot-wire anemometer for respiratory-gas-flow measurement has been investigated. It is shown that the anemometer satisfies common demands with respect to accuracy, responses time and to insensitivity to humidity and temperature variations. A calibration method is suggested that permits correction for variation of the flowmeter signal caused by changes of the gas composition. Finally, a procedure for linearisation of the flowmeter signal as a function of flow rate is presented.

6.9. Reproductive system

3625. An atraumatic instrument for the removal of a lost string intra-uterine device (Germ) - EIN ATRAUMATISCHES INSTRUMENT ZUR AUFFINDUNG UND ENTFERNUNG EINES IM UTERUS 'VERLORENEN' INTRAUTERINPESSARE - Terruhn V. - II Frauenklin., Univ. Munchen GFR - GEBURTSHILFE FRAUENHEILKD. 1978 38/12 (1024-1027) - summ in ENGL

A less common complication of intra-uterine device contraception is the lost string. Since the intra-uterine devices are more in use, the problem of the search for lost string intra-uterine devices has increased. An intra-uterine device forceps with a diameter of 2.5 mm. is presented. The instrument can easily be used in office practice. Removal of the device under general anaesthesia after dilation of the cervix with a large instrument can best be avoided.

3626. Inflatable penile prosthesis: Mayo Clinic experience with 175 patients - Furlow W.L. - Mayo Clin., Rochester, Minn. USA - UROLOGY 1979 13/2 (166-171)

Sex prosthetics have become an established alternative of therapy for both the organically and the psychogenically impotent male patient. Functional success with the implantation of the inflatable penile prosthesis can be anticipated in 90 to 95 per cent of the patients. Both mechanical and pathologic complications occur, but with relatively low frequency. There have been no reported operative or postoperative deaths associated with the implantation of more than 6,000 devices. The availability of penile prostheses to impotent patients should be limited only

by the patient's ability to meet the rigid criteria for selection of patients. When these criteria are fulfilled and the patient's expectations are in harmony with the known results that can be provided by implantation, uniformly successful results can be expected.

6.11. Nervous system

3627. Cerebral function monitor. Description. Principles of function and interpretation (Fren) - LE MONITEUR DE FONCTION CEREBRALE. DESCRIPTION - PRINCIPES DE FONCTIONNEMENT ET D'INTERPRETATION - Roujas F., Hrouda P., Laborit G. et al. - Dept. Anesth. Reanimat., Hop. Henri-Mondor, 94100 Creteil FRA - AGRESSOLOGIE 1978 19/2 (147-151) - summ in ENGL

The cerebral function monitor (CFM) permits constant surveillance of cerebral function. Cortical electrical activity, filtered in the frequency band of 2 to 15 Hz, is transcribed in the form of a tracing, the amplitude and level of which vary characteristically with certain modifications in cerebral function.

3628. Simple and easy method for measurement of ambulatory activity in mice (Japa) - Hirabayashi M., Iizuka M. and Tadokoro S. - Div. Behav. Analys., Behav. Res. Inst., Sch. Med., Gunma Univ., Maebashi JPN - FOLIA PHARMACOL. JPN. 1978 74/5 (629-639) - summ in ENGL

A hand-made apparatus which is easily manipulative, cheap, durable and clean was used to measure ambulatory activity in the mouse. The apparatus was assembled with two identical plastic round basins (commercially available, 25 cm in diameter) putting one upon the other. A pivot was fixed at the center of the outer surface of the inner basin (A), and its open end was inserted into the open socket fixed at the center on the bottom of the outer basin (B). Three microswitches equipped on the brim of (B) at equal intervals were activated and the counts were recorded according to the tiltings of (A) through the movements of the mouse. In order to examine the accuracy of the measurement, the effects of d-amphetamine (1.25 - 5.0 mg/kg), methamphetamine (1.0 - 4.0 mg/kg), cocaine (10 - 40 mg/kg) and morphine (5.0 - 20.0 mg/kg) on the ambulatory activity were investigated. Marked accelerating effects were observed dose dependently after the administration of all drugs. Furthermore, the patterns of activity showed characteristic properties of each drug. This method is especially useful to measure the acute effect of drugs on the ambulatory activity in mice, and many units can be set up at the same time.

3629. An atlas of the deep cerebellar nuclei and subtentorial brainstem of the cat with compensation for skull-size - Berntson G.G., Paulucci T.S. and Torello M.W. - Lab. Comp. Physiol. Psychol., Ohio State Univ. Res. Cent., Columbus, Ohio 43212 USA - BRAIN RES. BULL. 1978 3/5 (475-492)

The bony tentorium in the cat precludes a stereotaxic approach, in the coronal plane, to widespread areas of the cerebellum and underlying brainstem. To facilitate the application of the

stereotaxic method in these areas, an atlas of the subtentorial brainstem was prepared, with plates (30° from the vertical) based on an angle of entry which avoids the tentorium. In addition, a placement error regression function, based on a measure of skull size, was derived to provide atlas coordinate corrections for different brain sizes. The application of this regression function, together with the present atlas plates, can greatly increase placement accuracy.

3630. Controlled voltages for electroconvulsive therapy - Finlay J.B., Spencer E.A. and Mount J. - Univ. Hosp., London, Ont. CAN - MED. INSTRUM. 1978 12/2 (83-87)

A description is given for the design of an isolated output, servo-controlled voltage, electroconvulsive therapy (ECT) machine for the safe, controlled application of 60-Hz alternating current (ac) signals between 0 and 230 V rms for controlled periods ranging from 0.1 to 2 sec. Added safety is provided by current limiting in the range of 360 to 770 mA rms for patient impedances ranging from 500 to 50 Ω . The use of this equipment has permitted a detailed description of the impedances characteristic of unilateral ECT.

3631. Electrical brain stimulation for the control of chronic pain - Mullett K. - Neurol. Div., Medtronic, Inc., Minneapolis, Minn. USA - MED. INSTRUM. 1978 12/2 (88-91)

An implanted brain stimulation system can be used for control of chronic intractable pain that is unresponsive to other forms of treatment. A trial period of temporary stimulation first determines whether a patient is likely to benefit from a permanent implant.

3632. New technique for E.E.G. recording and drug infusion in the free moving mouse - Higashi A., Uchizono K., Hoshino M. et al. - Nat. Inst. Physiol. Sci., Okazaki JAP - MED. BIOL. ENG. COMPUT. 1979 17/1 (131-132)

The short life span of a mouse is favourable for chronic experiments, enabling one to record the electrical activities of the animal for the whole life (about a year). In chronic experiments, animals must be attached to wires and catheters leading to recording and perfusion apparatus with a slip-ring connector. The slip-ring connectors available commercially or usually made in laboratories seem to prevent free movement of small animals like mice. When such a device is used, wires and catheters are likely to be bitten off and tend to twist because of the circular movement of the mouse. In the present report, the authors introduce a slip-ring arrangement equipped with double springs and a micro-infusion pump, which hardly prevents a mouse from moving freely. A stable recording of the e.e.g. and the body movement of the animal by their apparatus will be also described.

3633. Comparison of different techniques for processing evoked potentials - Aunon J.I. and Sencaj R.W. - Sch. Electr. Engin., Purdue Univ., West Lafayette, Ind. 47907 USA - MED. BIOL. ENG. COMPUT. 1978 16/6 (642-650) - summ in FREN, GERM

A comparison is made of 3 techniques for processing

evoked potentials. These techniques are conventional signal averaging, crosscorrelation averaging and latency corrected averaging. Results obtained for 20 subjects are shown in the Appendix and the results for 2 of the subjects are analyzed in detail.

3634. Preparation and evaluation of a sustained morphine delivery system in rats - McGinity J.W. and Mehta C.S. - Coll. Pharm., Univ. Texas, Austin, Tex. 78712 USA - PHARMACOL. BIOCHEM. BEHAV. 1978 9/5 (705-708)

A new drug delivery system to induce physical dependence to morphine in rats is described. The device consists of a silicone polymer containing a water soluble 'carrier' material, sodium alginate, which swells on contact with moisture to release the drug. The silicone or silastic pellets formulated to contain morphine sulfate are very easily prepared and the advantages over existing methods to induce physical dependence to morphine are discussed. In addition, a comparison of the percent of drug released and withdrawal intensities in rats was made with a silastic-morphine sulfate pellet, silastic-morphine base pellet and a microcrystalline cellulose-morphine base pellet.

3635. Design and testing of a transistorized nerve stimulator - Rea J.L., Templer J.W. and Davis W.E. - Sect. Otolaryngol., Univ. Missouri Med. Cent., Columbia, Mo. 65201 USA - ARCH. OTOLARYNGOL. 1978 104/12 (730-731)

Presently available equipment for nerve stimulation includes the relatively expensive multifunction pulse generators and the disposable dc stimulators. We have designed a semidisposable, two-transistor pulse generator that is portable, inexpensive, and capable of dynamic nerve stimulation.

3636. Intracranial pressure. IV - Relationships with post capillary vascular pressures (Fren) - LA PRESSION INTRACRANIEUNE. IV - RELATION AVEC LES PRESSIONS POST-CAPILLAIRES - Benabid A.L., Persat J.C., De Rougemont J. et al. - Serv. Neurochir., CHU Grenoble, F. 38700 La Tronche FRA - J. PHYSIOL. (PARIS) 1978 74/4 (369-378) - summ in ENGL

The authors have demonstrated experimentally in dogs that, in all cases, the cortical venous pressure (Pvco) is higher than the intracranial pressure (PIC) which always remains higher than the sagittal sinus venous pressure (PSLS). The difference between Pvco and PIC remains statistically equal to 8 mm Hg and can be explained by the 'Vascular Waterfall' phenomenon; during Queckenstedt's test, the intracranial venous volume does not change, and is not the cause for the increase of PIC; this increase is due to the constancy of the difference between PIC and PSLS, which is induced by the resorption of CSF through the arachnoid villi. Increases in Pvco and PIC are shown to be equal to 70% and 72% respectively of the change in PSLS. Any other factor that increases PIC does not change PSLS, which remains equal to zero. As long as the cerebral blood flow is constant, the increase in cerebrovascular resistance of the veins at the site of their junction to the sagittal sinus must be compensated upstream by a vasodilatation, which

leads to a new distribution of the pressures along the cerebrovascular bed.

3637. Optimization of local thermocoagulation as applied to stereotaxic neurosurgery - Raamat R.E. and Labutin V.K. SUN - BIOMED. ENG. (N.Y.) 1978 12/3 (121-124)

Interrupted and continuous regimes with an average coagulation temperature, which give small zones of incomplete necrosis and which are simple when applied in practice, may be of practical importance in stereotaxic neurosurgery. To produce foci of destruction of average size (with a volume of destroyed tissue of 90-110 mm³) regimes with a coagulation temperature of 77-87°C can also be recommended. The use of low-temperature regimes with a long coagulation time and the use of short regimes with a high temperature, both of which increase the size of the zone of incomplete necrosis by 20-30%, was found to be unsatisfactory.

3638. The biomagnetic effect: Its application in acupuncture therapy - Hsu M. and Fong C. - Acupuncture Res. Inst., Sun Valley, Calif. USA - AM. J. ACUPUNCT. 1978 6/4 (289-296)

Magnetic energy was used instead of conventional electric, manual or needle acupuncture stimulation. Magnets of 1,500 Gauss or more were applied over acupuncture points, constituting a form of physiotherapy which was found to give remarkable and good analgesic effects in pain induced from many causes. Even higher effectiveness was seen in acute soft-tissue trauma, muscular wear and tear, shoulder cuff inflammation, benign joint pain, rheumatic arthritides, and certain neuralgias. Good results were also seen in superficial pains and body aches. A variety of simple biomagnetic acupuncture treatment techniques are described in detail and a number of typical cases studies are presented.

3639. Probability and the brain - Salzman M. - Div. Neurosurg., Univ. Maryland Sch. Med., Baltimore, Md. 21201 USA - NEUROSURGERY 1979 4/1 (75-82)

Probability theory asserts the lawfulness of seemingly random events in large populations and seems to be a reasonable approach to a general understanding of the structure and function of the nervous system. The brain, by virtue of the number of its components, the multiplicity of their possible interconnections, and the range and rapidity of their outputs, is almost implausably complex in its over-all design. Probability theory, therefore, is usually applied to descriptions of the behavior of large neuronal populations, statistical analysis of neuronal spike trains, and theoretical models of neuronal interaction. A consideration of each of these subjects is presented, as is a discussion of the most fundamental level of application of the theory to the nervous system: the assertion that the neuron and/or brain is inherently nondeterministic. In practical terms this is shown to be a 'nonissue', the uncertainty principle that follows has rather definite philosophical implications.

3640. Monitoring intracranial pressure - Wald A. -

Dept. Anesthesiol., Columbia-Presbyt. Med. Cent., New York, N.Y. USA - J. CLIN. ENG. 1978 3/4 (383-387)

This paper reviews the methods used in measurement and continuous monitoring of intracranial pressure. Terminology and measurement locations are reviewed. Practical considerations in monitoring are discussed along with the problems of monitoring particular sites. The limitations of the various methods are discussed.

3641. Flexible printed-circuit probe for electrophysiology - Pickard R.S., Joseph P.L., Collins A.J. and Hicks R.C.J. - Zool. Dept., Univ. Coll., Cardiff CF1 1XL GBR - MED. BIOL. ENG. COMPUT. 1979 17/2 (261-267)

Photofabrication techniques have been used to produce a nickel-iron microelectrode array on Kapton film specifically designed for biological implantation. The probe is 2.5 mm x 2mm and carries four tissue terminals, each 2 μ m in width. Both spontaneous and evoked potentials have been recorded from frog sciatic nerve. Developmental possibilities for the probe are fully discussed.

3642. Determination of the distribution of conduction velocities in human nerve trunks - Barker A.T., Brown B.H. and Freeston I.L. - Dept. Electron. Electric. Engin., Univ. Sheffield GBR - IEEE TRANS. BIO-MED. ENG. 1979 26/2 (76-81)

A technique is described which enables the distribution of conduction velocities within the alpha fiber group of an in situ human peripheral nerve trunk to be determined. The technique is based on the analysis of the shape of compound nerve action potentials recorded from surface electrodes and is non-invasive. Velocity distributions calculated for a group of normal adults are presented and represent the first known measurements of this parameter.

3643. On the frequency content on single pulses and periodic waves - Borrmann R.J. - Dept. Electr. Engin., Manhattan Coll., Riverdale, Bronx, N.Y. 10471 USA - ACUPUNCT. ELECTRO-THER. RES. 1978 3/3-4 (283-301)

This tutorial paper discusses the frequency spectra of some simple laboratory waveforms, based on Fourier Transform and Fourier Series analysis. It is shown that the effective bandwidth may be well approximated by the reciprocal of the pulse width. A table gives some properties of the Fourier Transform, and Appendices give a BASIC language computer program for computing Fourier bandwidth estimates, and an interpretation of frequency content in terms of musical tones.

3644. On phasing the small-angle X-ray diffraction pattern from nerve myelin - Blaurock A.E. - Div. Chem. Chem. Engin., California Inst. Technol., Pasadena, Calif. 91125 USA - BIOPHYS. J. 1979 26/1 (147-155)

Using a method they developed, Stamatoff and Krimm (1976) have phased swelling data from nerve myelin. Although most phases agree with those I determined previously, there are a few differences. In this letter the two different phasings, theirs and my

own, are used to compute the corresponding electron-density profiles, which are then closely compared. For both phasings, small differences are seen in the membrane profile at different degrees of swelling. The explanation that these differences are due simply to errors in measuring intensity is shown to be quite improbable; thus the differences indicate a real change in the profile. It follows that the assumption of a constant membrane profile appears to be invalid in the case of myelin swelling. The differences therefore are assumed to indicate a real change in the profile. It is shown that this change can be attributed consistently to interdigitation of protein molecules at the surfaces of neighboring membranes, while the membrane structure itself remains unchanged. In this case, valid phases still can be determined by swelling, but the phases determined by Stamatoff and Krimm are not valid.

3645. A model of human decision making in fault diagnosis tasks that include feedback and redundancy - Rouse W.B. - Dept. Mechan. Indust. Engin., Coordinated Sci. Lab., Univ. Illinois, Urbana, Ill. 61801 USA - IEEE TRANS. SYST. MAN CYBERN. 1979 9/4 (237-241)

A previously reported model of human decision making in fault diagnosis tasks is extended to include situations where feedback and component redundancy are important considerations. The model is based on concepts from the theory of fuzzy sets. The results of an experiment with human subjects are reported and used to estimate the parameters of the model.

6.12. Receptors

3646. Implantable hearing aids - Goode R.L. - Div. Otolaryngol., Dept. Surg., Stanford Univ. Med. Cent., Stanford, Calif. 94305 USA - OTOLARYNGOL. CLIN. NORTH AM. 1978 11/1 (155-161)

The author cautions the reader not to confuse the implantable hearing aid with the cochlear implant which has been designed for the profoundly deaf who are unable to use conventional hearing aids. The author states the major potential value of the implantable hearing aid and its improvement in sound fidelity as compared to conventional aids. As described by the author, the implantable hearing aid places an electromagnet on the malleus. All other components of the aid are worn externally behind the ear. With his device, speech discrimination was similar to that obtained with conventional speech audiometry. Subjective reports from subjects indicated favorable sound quality. However, gain was limited. To obtain more gain, the induction coil was placed deep in the ear canal about 4 mm from the magnet. This placement gave about 20 db gain at 1000 Hz and below. There was less improvement in gain at frequencies above 1000 Hz. One of the problems experienced by the author in the development of the implantable aid was inadequate gain with the external portion of the aid worn on the head. At this stage of development of the implantable aid, the power requirement would necessitate a larger power source which would negate the instrument being worn on the head. (Roach - Birmingham)

3647. Some questions about an implantable hearing instrument - Vernon J.A. - Kresge Hear. Res. Lab., Univ. Oregon Sch. Med., Portland, Ore. 97201 USA - OTOLARYNGOL. CLIN. NORTH AM. 1978 11/1 (163-171)

The author's criterion for an implantable hearing aid is that it must be significantly superior to any conventional hearing aid and its superiority must be known prior to surgery. A description of the device consisting of its component parts is given. In this research only the transducer was evaluated with the determination that the transducer could actuate the ear and approximate normal function. The author's evaluation of the transducer was two pronged. The author used guinea pigs to ascertain the alternating current cochlear potential generated in the inner ear. Determination of harmonic distortion was obtained by placing a 'whisker' in contact with the umbo of the manubrium. Other forms of distortion (phase, amplitude, intermodulation) were not put to test. Evaluation of the implantable device with normal humans was performed through the use of a standardized speech test and noise presentation. The author lists the following problems to be faced in the development of a successful implantable aid: (1) Procedures must be devised to evaluate the performance of the device prior to surgery; (2) Determination of the effect of the resonance of the ear upon the function of the implantable aid; (3) Excessive loading of the middle-ear structures by the device; (4) Orientation of the axis of the device for each subject; (5) Better standardization of speech and noise presentation to evaluate the implantable aid's performance; (6) Technical problems of selecting and assembling the components of the complete implantable device. When the total package has been assembled, further experimentation is needed in order to compare its efficiency with that of the conventional hearing aid. In the author's opinion, the desirability of the implantable aid is yet to be proved and its satisfactory development will not likely reach fruition in the near future. (Roach - Birmingham)

3648. The clinical value of single electrode systems in auditory prostheses - House W.F. - Dept. Surg., Univ. South. California Sch. Med., Los Angeles, Calif. USA - OTOLARYNGOL. CLIN. NORTH AM. 1978 11/1 (201-208)

The results of Single Electrode Implants in 15 patients is discussed. Preliminary psychological screening and rehabilitation are discussed. Awareness of sound in the environment and monitoring of speech was improved. The clinical value of the single electrode system appears to be confirmed, but the single electrode implant may be in the future restricted to subjects with limited neural populations. (Suggit-Queensland-Australia)

3649. Electrical stimulation of the human cochlea and the flexible multichannel intracochlear electrode - Jako G.J. - Dept. Otolaryngol., Boston Univ. Sch. Med., Boston, Mass. USA - OTOLARYNGOL. CLIN. NORTH AM. 1978 11/1 (235-240)

The development of a multi channel intracochlear electrode from platinum deposited on films is

described. (Suggit-Queensland-Australia)

3650. Kurzweil reading machine: Evaluation of model one - Scadden L.A. - Rehab. Engin. Cent., Smith Kettlewell Inst. Visual Sci., San Francisco, Calif. USA - J. VISUAL IMPAIRM. BLINDN. 1978 72/10 (415-418)

The Kurzweil Reading Machine (KRM) is a new direct translation, speech-output reading machine. Research to investigate speech comprehension with the KRM by blind users who varied in educational experience and personal reading motivation. The most frequently reported recommendation has to do with an improved contrast control system. Knowledge of the position of the scanner on a give page is needed.

3651. Holographic investigation of the mode of vibration of the human eardrum (Germ) - HOLOGRAPHISCHE UNTERSUCHUNG DER SCHWINGUNGSFORM DES MENSCHLICHEN TROMMELFELLS IN VIVO - Fritze W., Kreitlow H. and Ringer K. - II Univ. -HNO-Klin., Univ. Wein AUT - ARCH. OTORHINO-LARYNGOL. 1978 221/4 (255-259) - summ in ENGL

The mode of vibration of the human eardrum was investigated in vivo using holographic interferometry. The difficulties of the comparatively narrow outer-ear-channel and the micro-movements of the living body were solved by a double-pulsed rubin-laser. The insertion of an endoscopic optic into the ear-channel and the covering of the drum with aluminium powder (1 μ thick) are unimportant disturbances of the swinging system. The result show the maximum of the amplitude in the stapedial region - just the same mode of vibration as known from investigations of the isolated temporal bone. It is planned to test the influence of the frequency on the mode and the amplitude of vibration for both normal and pathological ears.

3652. A new high-efficiency earmould - Tucker I.G., Nolan M. and Colclough R.O. - Dept. Audiol., Univ. Manchester GBR - SCAND. AUDIOL. 1978 7/4 (225-229)

The problems associated with earmolds currently used by hearing-impaired persons, particularly children, are outlined. A new type of earmold which combines high efficiency with minimal feedback is described and evaluated.

3653. Loudness and the acoustic reflex: normal hearing listeners - Keith R.W. - Div. Audiol. Speech Pathol., Univ. Cincinnati Med. Cent., Cincinnati, Ohio USA - J. AM. AUD. SOC. 1979 4/4 (152-156)

The relationships among most comfortable listening level (MCL), loudness discomfort level, and the acoustic reflex to speech were studied on normal-hearing listeners using earphones and sound field test conditions. Recorded sentence materials were presented monaurally in quiet and, in the sound field, in the presence of 55 dB SPL cafeteria noise. The results indicate the MCL in the quiet sound field at approximately 70 dB SPL with the acoustic reflex occurring at 16 dB higher intensity. The earphone MCL was 7 dB lower than in the sound field, a finding

that may reflect a real reverse in usual earphone/sound field results or simply calibration factors particular to the speakers and test room used in this study. The AR to speech seems to occur at approximately equal intensities between the MCL and LDL tested in quiet. The MCL is elevated by noise whereas the acoustic reflex remains at a constant level, indicating that no absolute relationship exists between loudness and the AR.

3654. Director for the Choyce implant - Karickhoff J.R. - 200 Little Falls St., Falls Church, Va. 22046 USA - AM. J. OPHTHALMOL. 1979 87/4 (569-570)

I designed an instrument for directing the inferior and superior feet of the Choyce intraocular implant into the anterior chamber angle.

3655. Evaluation of ophthalmic materials - Augsburger A. - Coll. Optom., Ohio State Univ., Columbus, Ohio USA - AM. J. OPTOM. PHYSIOL. OPT. 1978 55/10 (700-705)

Ophthalmic materials from 11,677 spectacle prescription orders were evaluated during an 18 month period in a university optometry clinic. Five percent of the orders received were not acceptable based on criteria stemming from the ANSI-Z80.1-1972 standards. Almost two-thirds of these rejections were lens related. Frame-related rejections were predominantly due to gross human error. Rejection rate and delivery time varied widely among the supplying laboratories. Rejection rate did not decrease with increased delivery time. Since notifying the laboratories of our results, the percentage of unacceptable orders has decreased.

3656. Modification of a Kowa RC-2 fundus camera for self-photography without the use of mydriatics - Philpott D.E., Bailey P.F., Harrison G. and Turnbull C. - Ames Res. Cent., NASA, Moffett Field, Calif. USA - BRAIN RES. BULL. 1979 4/1 (123-125)

Research on retinal circulation during space flight required the development of a simple technique to provide self monitoring of blood vessel changes in the fundus without the use of mydriatics. A Kowa RC-2 fundus camera was modified for self-photography by the use of a bite plate for positioning and cross hairs for focusing the subject's retina relative to the film plane. Dilation of the pupils without the use of mydriatics was accomplished by dark-adaption of the subject. Pictures were obtained without pupil constriction by the use of a high speed strobe light. This method also has applications for clinical medicine.

3657. Lasers in ophthalmology: The path from theory to application - Wolbarsht M.L. and Landers M.B. III - Duke Univ. Eye Cent., Durham, N.C. 27710 USA - APPL. OPT. 1979 18/10 (1518-1526)

The argon laser for diabetic retinopathy therapy was originally selected for photocoagulation by matching peak emission to hemoglobin absorption to maximize obliteration of retinal blood vessels. Present clinical experience in the treatment of diabetic retinopathy does not show any marked advantage of argon lasers over ruby and xenon photocoagulators not matched to

hemoglobin absorption. The efficacy of photocoagulation is shown to depend upon the interaction between choroidal and retinal blood supplies in tissue oxygenation and depends upon pigment epithelium absorption to destroy rods and cones. Design specifications for new laser photocoagulators and alternative (supplemental) therapy for diabetic retinopathy are given.

3658. Construction of an inexpensive hydraulic microdrive for recording single nerve cell activity - Rieke G.K. - Dept. Anat., Olin E. Teague Res. Cent., Coll. Med., Texas A&M Univ., College Station, Tex. 77843 USA - REV. SCI. INSTRUM. 1979 50/5 (637-639)

A hydraulic microdrive that can be constructed for less than thirty dollars is described. The microdrive is assembled from stock hardware and two glass syringes. It consists of three sections: a base section; a driver section; and a carriage section. The master cylinder is a 5 cm³ syringe, while the slave cylinder is a 50 cm³ syringe. The piston of the slave cylinder moves 10 µm for each 10° arc through which the drive wheel passes. The microdrive is effective in that it serves as the vehicle by which metal or glass electrodes are brought next to single nerve cells in order to record the electrical activity of the cells.

6.13. Locomotor apparatus

3659. A system for clinically evaluating wheelchair pressure-relief cushions - Garber S.L., Krouskop T.A. and Carter R.E. - Occup. Ther. Dept., Texas Inst. Rehabil. Res., Houston, Tex. USA - AM. J. OCCUP. THER. 1978 32/9 (565-570)

Pressure-related decubitus ulcers are a frequent disability and life threatening complication in the management and rehabilitation of patients with spinal cord injuries. This paper describes a system developed to quantitate and evaluate a patient's response to wheelchair pressure-relief cushions. Maximum pressure and the tissue pressure distribution on six varieties of wheelchair cushions were determined for a sample of 57 patients with a history of decubitus ulcers. Wide variations in (mean) maximum pressure were observed. However, even greater variations were found in the distribution (bony/soft tissue) of the pressure. These data demonstrate that no single cushion was clearly superior in relieving pressure for all patients. Therefore, individualization of wheelchair cushions for each patient may be essential in order to minimize the probability that the person will experience a tissue pressure problem.

3660. A single-switch control for wheelchairs and other equipment - Durie N.D. - Nat. Res. Council, Ottawa K1A 0R8 CAN - MED. PROG. TECHNOL. 1978 6/1 (15-18)

In cerebral palsy, hand function may be severely curtailed. In some cases, the sole operable device may be a single switch of special design. In such cases, electronic scanning, actuation, and error correction may be necessary. This paper describes such a system, which is in use for typing and for control of an electric wheelchair.

3661. Mechanical and tribological properties of ceramic endoprostheses (total hips) (Germ) - MECHANISCHE UND TRIBOLOGISCHE EIGENSCHAFTEN KERAMISCHER ENDOPROTHESEN - Doerre E. and Dawihl W. - Feldmuhle AG, D 7310 Plochingen GFR - BIOMED. TECH. 1978 23/12 (305-310) - summ in ENGL

Due to their favourable properties high density alumina ceramics have already proved to be successful for artificial joints. When applied to heavy load bearing joints, such as hip joints for example, ceramic components are exposed to considerable static and dynamic loads for a long period of time. It was the objective of this paper to make life predictions by investigating the fatigue strength of high density alumina ceramics under static, dynamic, and impact loads, as well as by investigating the tribology. The investigations of the mechanical properties carried out with test samples and complete ceramic-metal-prostheses as well have shown a behaviour of high density alumina similar to plastically deformable metals, resulting in graphs for flexural and impact strength being congruent to so called 'Wohler-Graphs'. From this data it can be deduced that there is a lower limit of mechanical loads, which can be endured for any long period of time. The results of the mechanical and tribological investigations demonstrate, that the ceramic components of the total hip endoprostheses described above meet all the requirements occurring in practice. This has been proven in a great number of successful clinical cases.

3662. A new orthotic concept in the non-operative treatment of idiopathic scoliosis. A preliminary report - Glancy J. - Div. Orthot., Dept. Orthop. Surg., Sch. Med., Indiana Univ., Purdue Univ., Indianapolis, Ind. USA - ORTHOT. PROSTHET. 1978 32/4 (15-31)

Static orthoses are limited to reacting with an equal and opposite force to the weight of the trunk. As a consequence, the magnitude of force required to manipulate, or 'preposition', a curvature must be applied before and/or during the donning of these orthoses. A new dynamic scoliosis orthosis has been developed that utilized components that generate dynamic forces that act upon a curvature(s) while the wearer is asleep. The rationale and design criteria from which the orthosis was developed is described in considerable detail. The components and the function of the dynamic orthosis have been described in full.

3663. New underarm three-point holding orthosis for management of low scoliotic curves - Morein G., Schuster I. and Seelenfreund M. - Zamenhoff Orthot. Lab., Petah Tiqva ISR - ORTHOT. PROSTHET. 1978 32/4 (32-34)

Idiopathic scoliosis remains a challenge to the orthopedic surgeon and orthotist. In recent years the use of orthoses has been found to be a useful method of preventing and increase in the developing curve and the 'Milwaukee Three Point Brace' has proved to be the most effective in this respect. The need to wear a brace with a superstructure which cannot be concealed by ordinary clothing is a source of considerable inconvenience and embarrassment to the patient. For this reason an effort is being made to construct an

orthosis which eliminates the neck piece but is still based on the three point holding principle. Our experience has shown that this type of orthosis satisfactorily provides an adequate correction of the scoliotic curves in the lumbar and dorso lumbar regions.

3664. Functional analysis of the UC-BL shank axial rotation device - Lamoureux L.W. and Radcliffe C.W. - Biomech. Lab., Univ. California, Berkeley, Calif. 94720 USA - PROSTHET. ORTHOT. INT. 1977 1/2 (114-118)

The installation in an above-knee prosthesis of a device which allows rotation of the socket over the fixed foot has been shown to offer the amputee advantages. The usefulness of an axial rotation device for above-knee amputees has been demonstrated clinically with tests on research patients over a period of 30 yr. The present design has been used successfully by several amputees for periods of up to 18 mth without malfunction and it appears to have overcome the shortcomings of previous units. More extensive amputee trials will begin in the near future under the auspices of the Veterans Administration Prosthetics Center in New York City. It is possible that experience may demonstrate that asymmetrical spring rates, non-linear elasticity, or a change in rotation axis may improve future devices, particularly for the below-knee amputee.

3665. Versatile wheelchair control system - Aylor J., Ramey R., Schaddegg J. and Reger S. - Univ. Virginia, Rehab. Engin. Cent., Charlottesville, Va. 22901 USA - MED. BIOL. ENG. COMPUT. 1979 17/1 (110-114)

An electric wheelchair control system is described that offers an increased ease of operation to conventional wheelchair users and makes it possible for persons with severe pathologic hand movements to control wheelchairs in a safe and satisfactory manner. The control system is designed so that its characteristics are easily adjusted by the therapist to match the patient's control abilities. Chair acceleration, maximum speed and joystick-position averaging are adjusted by means of plug-in modules. There is only a disconnect relay that is activated when the joystick is grasped or addressed with a mouth stick. This relay functions as a 'deadman control' by applying dynamic braking when the joystick is released. The absence of other relays results in noise-free operation. Cruise control is included to permit the drive motors to develop full torque automatically when required, regardless of the joystick position. This control system can be applied to any existing wheelchair that uses two motors for steering/pulsion, provided two batteries are used to provide a +6, 0, -6 or +12, 0, -12V supply. The design focused on portability so that the control system does not interfere with folding the wheelchair.

6.14. Skin

3666. Application of ultrasound in assessing burn depth - Kalus A.M., Aindow J. and Caulfield M.R. - Dept. Plast. Surg., Queen Victoria Hosp., East Grinstead, Sussex GBR - LANCET 1979 1/8109 (188-189)

Conventional pulse echo ultrasound equipment was modified to provide resolution capable of distinguishing the interfaces in burnt skin. The identification of these interfaces allowed a quantitative assessment of the depth of a burn. Ultrasound is non-invasive and accurate, and so is highly acceptable for clinical use.

3667. Induced thermal resistance in the mouse ear - Law M.P., Coultas P.G. and Field S.B. - MRC Cyclotron Unit, Hammersmith Hosp., London W12 0HS GBR - BR. J. RADIOL. 1979 52/616 (308-314)

The mouse ear (pinna) was used to investigate the effect of two hyperthermic treatments. Heating was by immersion in hot water at 43.5°C. A single treatment of about 50 minutes was required to cause necrosis in 50% of the ears heated. When heat treatment was given in two equal fractions the total heating time had to be increased if the interval between fractions was greater than four hours. By 24 hours a total treatment of about 100 minutes was required, indicating almost complete recovery from the first heating. Priming treatments at 43.5°C induced thermal resistance to a second heat treatment at 43.5°C. Maximum resistance was observed one day after a 20 minute priming and two days after a 40 minute priming, when the heating time had to be increased to 120 minutes, an increase by a factor of 2.4. Shorter priming treatments induced less resistance, the minimum heating time to produce an effect being two minutes. In all cases the effect decreased during the next four to five days. These results indicate that the reduced response of tissues to fractionated hyperthermia is due both to the repair of sublethal heat damage and induction of thermal resistance.

3668. The effect of prior heat treatment on the thermal enhancement of radiation damage in the mouse ear - Law M.P., Ahier R.G. and Field S.B. - MRC Cyclotron Unit, Hammersmith Hosp., London W12 0HS GBR - BR. J. RADIOL. 1979 52/616 (315-321)

The effects of prior heat treatment on the skin reaction produced by a subsequent treatment with combined heat and X rays were investigated in the mouse ear. Ears were heated by immersion in hot water. The priming heat treatment was always 43.5°C for 40 minutes. Its effect was transient, beginning between 24 and 48 hours after the priming treatment and reaching a maximum at 48 to 96 hours when there was a reduction in the skin response to combined heat and X rays, i.e. it caused a reduction in the thermal enhancement ratio (TER). The effect was lost by 192 hours. At 96 hours after the priming treatment the TER for 30 minutes at 42.5°C or at 43.5°C was reduced by a value equivalent to decreasing the temperature by about 0.4°C. This was equivalent to increasing the heating at 43.5°C required to produce a given enhancement of radiation damage by a factor of 1.4 relative to that required without prior heating. The effect was smaller than induced resistance to damage caused by severe heat treatment alone (i.e. necrosis) and it occurred later. These differences support the concept that two separate mechanisms underlie direct heat necrosis and thermal enhancement of radiation damage.

6.15. Aerospace medicine

3669. Standardized night visual acuity testing for airline pilots with a new nyctometer (Japa) - Kabayama T., Tsuneoka H., Fukuda J. et al. - Dept. Ophthalmol., Jikei Univ. Sch. Med., Tokyo JPN - JPN. J. CLIN. OPHTHALMOL. 1979 33/1 (45-50) - summ in ENGL

Intact night visual acuity is required as one of the vocational aptitudes for airline pilots. A new nyctometer was developed by the committee for night visual acuity test instrumentation and was used in the present study. The instrument allows the determination of correct visual acuity within a short time. After light adaption at 7,000 asb, for one minute, a dimly illuminated optotype at 1.5 asb is presented in total darkness to the test subject. The time required to read the optotype serves as indicator for night visual acuity. A total of 391 males, who had full daytime visual acuity and who were less than 29 years in age, were subjected to the study. A simplified criterion for the night visual acuity from the data as follows: when the optotype is seen monocularly, it is read in 30 seconds if the night visual acuity is 0.2 and over, and in 60 seconds if the visual acuity is 0.4 and over. When seen binocularly, the optotype is read in 30 seconds if the visual acuity is 0.4 and over, and in 60 seconds if the acuity is 0.6 and over.

3670. Stereological ultrastructural analysis of the axonal endings in the neuromuscular junction of rats after a flight on Biosputnik 782 - Baranski S. and Marciniak M. - Inst. Aviat. Med., Med. Acad., Warsaw POL - AVIAT. SPACE ENVIRON. MED. 1979 50/1 (14-17)

The study was aimed at quantitative and qualitative evaluation of the axonal endings of the neuromuscular junction in the quadriceps femoris muscle and the diaphragma in animals after a space flight. Quantitative morphometric studies at the ultrastructural level demonstrated a statistically significant diminution of the mean number of mitochondria and synaptic vesicles on the cross section of the axonal endings. Qualitative analysis of electronograms revealed morphological changes indicating degeneration and various degrees of injury in some of the axonal endings of the neuromuscular junction.

6.16. Work and sport

3671. The effects of automobile inspections on accident rates - Schroer B.J. and Peyton W.F. - Kenneth E. Johnson Environm. Energy Cent., Univ. Alabama, Huntsville, Ala. 35807 USA - ACCID. ANAL. PREV. 1979 11/1 (61-68)

To determine whether diagnostic inspections reduce accidents, this paper compares the accident rates of vehicles which participated in the Alabama Motor Vehicle Diagnostic Inspection Demonstration Program with vehicles which did not actively participate. In Huntsville the accident rate of inspected vehicles represents an improvement of 9.1% over the rate of uninspected vehicles. Furthermore, the accident rate of inspected vehicles decreased 5.3% after inspection. Whereas the monthly accident rate of the responsive

participant who returned for subsequent periodic inspections did not significantly increase in eighteen months, the monthly accident rate of unresponsive participants increased to the level of uninspected vehicles. Vehicles involved in accidents were in significantly worse mechanical condition on the average than those not involved in accidents. The data suggests that poor mechanical condition is a significant factor in motor vehicle accidents and that annual inspections are a desirable means of reducing accident rates.

6.17. Radiology

3672. Evaluation of mammographic screen-film systems - Arnold B.A., Webster E.W. and Kalisher L. - Dept. Radiol., Massachusetts Gen. Hosp. Harvard Med. Sch., Boston, Mass. USA - RADIOLOGY 1978 129/1 (179-185)

Four screen-film systems were evaluated for their imaging properties in mammography. Modulation-transfer functions were measured at 40 kVp. Absolute screen-film sensitivities in mR and entrance exposures were measured with tungsten and molybdenum target tubes. Five radiologists viewed radiographs of a phantom containing microgranules of SiC ranging in diameter from 590 to 120 μm . The Rarex-B screen - composed of yttrium oxysulfide - performed best, allowing phantom radiographs at 185 mR with image quality sufficient to demonstrate microgranules greater than 330 μm in dimension.

3673. A somatic dose index for diagnostic radiology - Laws P.W. and Rosenstein M. - Dickinson coll., Carlisle, Pa. 17013 USA - HEALTH PHYS. 1978 35/5 (629-642)

Irradiation of the human body in diagnostic X-ray procedures results in different absorbed doses in the various body organs. A somatic dose index is formulated by applying the relative sensitivity of the human to each of the most important somatic effects and utilizing the absorbed dose in the affected organs. This quantity is used to convey a cumulative somatic impact and is computed for common radiographic views in diagnostic radiology as a function of beam quality for a nominal IR entrance exposure. Using typical X-ray beam qualities and exposures, the frequency of the various radiographic views that make up an examination and the frequency of the various examinations in the national population, illustrative examples of the application of the somatic dose index are presented.

3674. An electronic storage system with histographical representation for axial load measurement in modular prostheses (Germ) - EIN ELEKTRONISCHES SPEICHERVERFAHREN ZUR MESSUNG UND HISTOGRAPHISCHEN DARSTELLUNG DER DRUCKKRAFTE IN ROHRSKELETTPROTHESEN - Von Nettelhorst H., Boenick U. and Steffens H.P. - Fachgebiet Biomed. Techn., Techn. Univ., Berlin GFR - BIOMED. TECH. 1978 23/12 (311-314) - summ in ENGL

The design of leg prostheses in lightweight construction and life time tests require to day

improved knowledge of the dynamic forces and moments acting on the leg during walking as well as sufficient information about their frequency distribution. The measurement of these parameters was so far carried out using telemetry units and portable tape recorders respectively, which means a comparably high technical effort. As an alternative this paper presents a nonexpensive electronic measuring and storage system which allows to conduct these measurements under normal daily activity conditions without influencing the subject or limiting the ambulation area. The first results obtained from one patient are reported.

3675. The influence of the cassette front on patient radiographic exposure - Kelley J.P. and Trout E.D. - X-Ray Sci. Engin. Lab., Oregon State Univ., Corvallis, Ore. 97331 USA - HEALTH PHYS. 1979 36/1 (13-15)

The influence of the cassette front, stated in aluminum equivalence at 60 and 100 kVp, has been studied using six commercially available cassettes, a chest test phantom, and a general radiographic test phantom developed in this laboratory. The effect on exposure of the aluminum equivalence of the cassette front is quite pronounced in those techniques where no grid is used. The influence on exposure is less pronounced when a grid is used.

3676. An automatic over-range correcting circuit - Korba L.W. and Cousin A.J. - IBM Canada, Toronto CAN - MED. BIOL. ENG. COMPUT. 1979 17/1 (133-134)

The automatic over-range circuit was developed for use in an ultrasonic instrument intended for measuring very small diameter changes of the human foetal chest cavity. The measurement thus made represents foetal breathing movements.

3677. The aqueous coumarin system as a low range chemical dosimeter - Ashawa S.C., Kini U.R. and Madhvanath U. - Div. Radiol. Protect., Bhabha Atom. Res. Cent., Trombay, Bombay-400 085 IND - INT. J. APPL. RADIAT. ISOT. 1979 30/1 (7-10)

A chemical dosimetric system, aqueous coumarin, has been developed. The dosimeter can be used to measure doses in the range 10-6000 rad using fluorescence method and in the range 5-56 krad using optical absorption measurements. The energy dependence of this dosimeter was studied and it was found that the response decreases by about 9% at energies encountered in deep X-ray therapy as compared to its value for cobalt-60 gamma rays. However, at diagnostic X-ray energies (80 kV), the response is less by about 36%. The dosimeter is independent of dose rate up to about 100 rad min^{-1} but the response decreases as the dose rate is increased. It is independent of temperature during irradiation up to 29°C but the response slightly increases beyond this temperature. The dosimeter also shows good pre- and post-irradiation stability.

3678. The selection, acceptance testing, and quality control of radiotherapy treatment simulators - McCullough E.C. and Earle J.D. - Div. Radiat. Ther., Dept. Oncol., Mayo Clin. Found., Rochester, Minn.

The critical aspects of selection, acceptance testing, and quality control of a radiotherapy treatment simulator are discussed. The selection of a simulator involves consideration of: (a) motions and readouts, (b) safety features, (c) x-ray and imaging systems, and (d) mechanical tolerances (including guarantees). When considering motions, it is important to ascertain the extent of each motion, motorization and speed, control location, and the location, accuracy, and type of scale. Important questions in x-ray system selection concern (a) x-ray generator ratings and phase, and (b) details of the x-ray tube and image intensification system.

3679. Use of a programmable pocket calculator in radiotherapy treatment planning - Edwards F.H. and Coffey C.W. - Dept. Radiat. Med., A.B. Chandler Med. Cent., Univ. Kentucky, Lexington, Ky. 40506 USA - RADIOLOGY 1979 131/1 (255-256)

Software packages for a programmable pocket calculator have been developed for use in dosimetry. Using a field equation and a mathematical model of the beam profile, one can find the dose delivered to any point within the irradiated volume. Use of these programs for simple field calculations allows the radiologist to concentrate on more complex treatment plans.

3680. A vertical couch extender - Gillin M.T., Kline R.W., Goshaw L.J. and Tonkyn R.J. - Dept. Ther., Med. Coll. Wisconsin, Milwaukee County Med. Complex, Milwaukee, Wis. 53226 USA - INT. J. RADIAT. ONCOL. BIOL. PHYS. 1979 5/2 (269-270)

A patient treatment couch extender was designed and constructed to permit the use of large anterior and posterior fields while keeping the patient in the supine position during the entire course of treatment. Such a device is currently in use on a 6 MV, 100 cm isocenter unit with a retractable beam stop and a 4 MV, 80 cm unit with a counterweight. Treatment parameters and construction details are presented.

3681. A missing tissue compensator - Feaster G.R., Agarwal S.K., Huddleston A.L. and Friesen E.J. - Radiol. Phys. Div., Univ. Virginia Sch. Med., Charlottesville, Va. 22901 USA - INT. J. RADIAT. ONCOL. BIOL. PHYS. 1979 5/2 (277-280)

A method is described for the fabrication of missing tissue compensators used in radiation therapy. This method uses layers of styrofoam plastic and a hot-wire cutting machine to construct a mold in which the compensator is made from tissue equivalent material. When the patient contours are provided, no special equipment or materials are required beyond those normally found in a therapy clinic.

6.18. Anesthesia

3682. Theatre ventilation. A comparison of design and observed values - Male C.G. - Dept. Anaesth., Bristol Roy. Infirmary, Bristol BS2 8HW GBR - BR. J. ANAESTH. 1978 50/12 (1257-1263) - summ in FREN, GERM

The ventilation rates of 23 operating theatres were

tested randomly. These were found to vary widely from design specifications (-43 to +40%). One modern theatre was studied intensively for 6 months and the causes of poor ventilation determined. Preventive maintenance schemes are justified by a positive relationship with plant performance. The influence of theatre ventilation on contamination with anaesthetic agents and the medico-legal implications of poor theatre ventilation are discussed. There is a need for main duct airflow signals, displayed in theatre, to warn personnel of low levels of theatre ventilation.

3683. The Foam Nose - a new disposable heat and moisture exchanger. A comparison with other similar devices - Revenas B. and Lindholm C.E. - Dept. Anaesthesiol., Univ. Hosp., Uppsala SWE - ACTA ANAESTHESIOL. SCAND. 1979 23/1 (34-39)

The Foam Nose (Kemi-Intressen AB), a heat- and moisture exchanger (HME), was compared with two other commercially available HMEs with respect to its heat and moisture exchanging capacity. During steady state, 77% of the expired humidity is restored to the airways with the Foam Nose, 63% with HME Portex and 63% with HME Dameca.

3684. A versatile antipollution device - Saunders J.M. - Queen Elizabeth Hosp., Adelaide AUS - ANAESTH. INTENSIVE CARE 1979 7/1 (69-72)

Removal of anaesthetic pollutants from the operating theatre environment requires the use of relatively sophisticated equipment which must be added to an existing life support system (the anaesthetic machine). The interface is only one part of this system and to be safe and satisfactory it must be as simple and versatile as possible and be designed in such a way as to render incorrect connection and use virtually impossible. A device designed by the authors is described.

6.19. Monitoring

3685. The 'paralarm' - A warning device for the prevention of ischaemic ulcers - Wijkman D.W., de Soete H., Kwee H.H. et al. - IRIA, 78150 Le Chesnay FRA - PROG. REP. MED. FYS. INST. TNO 1978 No. 6 (14-17)

The development of an apparatus called 'Paralarm' is reported. The 'Paralarm' serves as a warning device for the prevention of ischaemic ulcers for paraplegics bound to a wheelchair.

7. SURGICAL INSTRUMENTS

3686. A guided osteotome for the resection of the osteocartilaginous nasal hump - Drever J.M. - Plast. Surg. Serv., Reg. Hosp. Mercedes, Soriano URY - PLAST. RECONSTR. SURG. 1978 62/3 (467-469)

An instrument for the resection of the osteocartilaginous hump is presented.

3687. University college hospital muscle-biopsy needle - Young A., Wiles C.M. and Edwards R.H.T. - Dept. Hum. Metab., Univ. Coll. Hosp. Med. Sch., London GBR - LANCET 1978 2/8103 (1285)

Interest in needle biopsy of muscle for the diagnosis

of neuromuscular disorders has steadily increased since the authors described the technique in this journal. At the IVth International Congress on Neuromuscular Diseases they reported their experience of 490 such biopsies; in discussion it became apparent that some workers had found difficulty using the needle originally introduced by Bergstrom. The authors describe a modification which overcomes the main problem experienced with Bergstrom's needle-i.e., the small size of the sample. This modified needle is very satisfactory in clinical practice when muscle samples are required for chemical analysis, histochemistry, and electron microscopy.

3688. Retractor for retinal detachment surgery - Brockhurst R.J. - Dept. Retina Res., Retina Found., Boston, Mass. USA - AM. J. OPHTHALMOL. 1979 87/4 (574)

The forked retractor that is most commonly used in retinal detachment surgery was designed originally to allow the passage of needles in a scleral resection operation. Today scleral resections are rarely performed for retinal detachments. In modern types of retinal detachment surgery, the forked retractor allows orbital tissue to prolapse into the field, especially when retinal breaks are posterior. I have devised a solid spade type retractor that prevents the prolapse of orbital tissue. The blade can be manually bent to adjust the angle between handle and blade.

3689. A new type of contact lens for vitrectomy - Stenkula S. - Dept. Ophthalmol., Region Hosp., S-701 85 Orebro SWE - AM. J. OPHTHALMOL. 1979 87/4 (575-576)

I designed a new type of contact lens for vitrectomy that consists of an outer scleral part and an inner rotatable cylindrical piece with a prismatic anterior surface.

9. COMPUTER APPLICATIONS

3690. Automated problem encoding system for ambulatory care - Rada R. and Evans L.A. - Dept. Computer Sci., Univ. Illinois, Urbana, Ill. USA - COMPUT. BIOMED. RES. 1979 12/2 (131-139)

The partially automated record system in the Harris County Community Clinics was improved by the development of a problem statement encoder of the modified table look-up variety. The new system codes a statement in less than 0.1 sec of CPU time, codes correctly more than 80% of statements and can work with many classification schemes. The system starts with a very short and simple computer program, takes as input some set of coded problem statements, builds its own reference table and then codes new statements. Remarkably, the programs plus the table fit in only 5000 words of computer memory. Since any particular medical clinic will tend to emphasize a subset of medical language, statements taken from that subset are ideally suited for constructing a concise but accurate coder for that clinic.

9.1. Hospital automation

9.1.1. Laboratory techniques

3691. Experience in application of electronic data processing in routine medical microbiology (Germ) - ERFAHRUNGEN MIT DER ANWENDUNG ELEKTRONISCHER DATENVERARBEITUNG IM BAKTERIOLOGISCHEN ROUTINELABORATORIUM - Essinger U., Grundmann E., Mandel P. and Walter K. - Inst. Labormed., Stadt. Klin., Darmstadt GFR - ZENTRALBL. BAKT. PARASITENKD. INFEKTIONSKR. HYG. ABT. 1 ORIG. A 1978 242/1 (106-120) - summ in ENGL

Experiences in a two year application of electronic data processing in medical routine microbiology are reported. Optical mark reader forms serve as request forms as well as work protocol. On the left two thirds of these forms the patients' data, including clinical statements, and the kind of specimen to be investigated, (sputum, smear, etc) as well as results not essential for the printout of laboratory reports are filled in. On the right third of the optical mark reader form, in which area the Bell & Howell document reader can read pencil marks, the patient's identification number, the tests requested and all results are marked right at the work bench. As shown in the flow diagram after completion of the investigation the data on the mark reader forms are read mechanically and the test results are printed by means of the computer. In addition, the data processing system, which proved to be very flexible, performs all necessary types of administrative work, as filing of laboratory data in a coded form on cards for permanent storage statistics and the printout of bills. The processing of routine microbiology data is achieved by a Siemens DVA 404/3 (64 kbt) connected to a magnetic disc device (2993 Mio bytes), and a line printer (60000 lines per hour) and dialog display monitors, which are used simultaneously for the on line and off line handling of all the data in clinical chemistry-, serology and hematology-departments of the same institute.

3692. A computer system with central support for multiple use in general hospitals of varying sizes - Haase H. - Kirchl. Gemeinsch. Stelle EDV, Frankfurt/M GFR - METHODS INF. MED. 1979 18/1 (1-5) - summ in GERM

The concept of an EDP system with central support for the use in general hospitals of various sizes for the collection, storage and presentation of data for patient admission, administration and laboratory services is presented. It is an economic concept with a software independent from the size of the computer system, and it shows a simple linear growth of user demands with an increase in hardware and operating costs. It is reported that the application software can be run on various computers of different manufacturers. Data processing for administrative functions (billing etc.) is handled by an external data processing center.

3693. Computer simulation of the effectiveness of male-linked translocations for the control of Anopheles albimanus Wiedemann - Seawright J.A., Haile D.G., Rabbani M.G. and Weidhaas D.E. - Insects Affect. Man Res. Lab., Agric. Res. Serv., US Dept. Agric.,

Gainesville, Fla. 32604 USA - AM. J. TROP. MED. HYG. 1979 28/1 (155-160)

A deterministic simulation model was used to establish the potential value of releasing male-linked translocation heterozygotes as a control measure for *Anopheles albimanus* Wiedemann. Theoretical population reductions exceeding 90% were obtained within 90 and 120 days after releases at initial ratios of 5 translocation males (TM): 1 normal male (NM) and 1 TM: 1 NM, respectively. Additional simulations emphasized the importance of the need for a method that would eliminate females from the release material. Releases containing 15% females were less effective than those with none. When a malaria subroutine was included in the model, the calculations showed that all the theoretical releases greatly reduced the number of malaria-infective females and therefore would have a profound effect on transmission of the disease. The number of malaria-infective females present was eliminated completely when only translocation males were released; however, a small number were present when the releases contained 15% females. Male-linked translocation males required longer periods of time to bring about population control than males that were completely sterile.

3694. A versatile microcomputer-based temperature and cooling/warming rate controller - McGann L.E. - Div. Biomed. Engin. Appl. Sci., Univ. Alberta, Edmonton T6G 2N8 CAN - CRYOBIOLOGY 1979 16/1 (97-100)

A microcomputer-based system has been developed for the control of temperature from 199.9° to -199.9°C, and rate of change of temperature from 0.01° to 99.99°C/min. A digital thermometer is used to monitor the temperature, and the system can control a variety of heating and cooling equipment. The system is economical, easy to construct, simple to program, and may be extended to perform a wide variety of functions based on the control of temperature.

3695. Inexpensive computer-controlled experimentation - Rodrigues A.R.D. and Siddons D.P. - Wheatstone Lab., King's Coll., Strand, London GBR - J. PHYS. E. SCI. INSTRUM. 1979 12/5 (403-408)

The choice of a computer suitable for general-purpose laboratory automation is discussed, with particular reference to those facilities which provide convenient and straightforward operation. A detailed design is presented for a versatile yet economical interfacing system for use with one particular computer. Sufficient detail is presented to enable anyone with minimal electronics or computing knowledge to duplicate the system and to write programs for it. Its compatibility with other systems is briefly discussed, and an indication given of how the system may be modified to suit other processors.

9.4.1. Electrocardiography

3696. Sensor: A system for Computerized Enumerative Scanning On Rhythm disturbances - Swenne C.A., Vennix H.W.A., van Heme N.M. and Duisterhout J.S. - St Antonius Hosp., Utrecht NLD - PROG. REP. MED. FYS. INST. TNO 1978 No. 6 (189-199)

A recently developed computer system for rapid scanning on rhythm disturbances in EKG recordings is presented. The system reduces the EKG to a series of PR intervals and corresponding typifications of QRS complexes. This result is achieved in two steps. Firstly, QRS complexes are detected and classified into families. This procedure is fully automated. Secondly, the resulting families are typified in an electrocardiographic sense. This is interactively done. The resulting data are kept on a mass storage device and can be used to provide any desired output. First experiences with the system in processing ambulatory (Holter) recordings are described. Different fields for the application of the system are suggested.

3697. A two-dimensional clustering technique for identification of multiform ventricular complexes - Knoebel S.B. and Lovelace D.E. - Krannert Inst. Cardiol., Indianapolis, Ind. USA - MED. INSTRUM. 1978 12/6 (332-333)

A computer algorithm for the identification of multiform ectopic ventricular complexes in 24-hour ambulatory electrocardiographic recordings is described. The clustering technique establishes regions, based on R-R interval and ST-segment slope, in a two-dimensional probability space based on the fit of each ventricular complex. The boundaries of any overlapping regions are analyzed using a Bayesian decision rule to minimize misclassification.

9.4.2. Electroencephalography

3698. The scalp topography of human short latency auditory evoked responses (Japa) - Soda T., Kato T., Shirabe S. and Shiraishi K. - Dept. ORL, Sch. Med., Fukuoka Univ., Fukuoka JPN - OTOLOGIA FUKUOKA 1978 24/SUPPL. 2 (571-583) - summ in ENGL

The scalp distributions of human auditory evoked responses were studied by the method of the computerized display system. Early (0 to 10 ms.) and middle (10 to 50 ms.) latency responses were recorded on electrode locations of 10-20 system to binaural and monaural stimulation. The auditory evoked potentials obtained from each location were interpolated by means of the two-variable sampling function. Then the interpolated values were quantified to 11 levels and finally the quantified values were printed out on a line-printer as the scalp topography of the auditory evoked responses.

9.5. Patient monitoring

3699. Computer assisted trend analysis - a new approach to patient monitoring in newborn intensive care areas (Germ) - COMPUTER-TRENDANALYSE - EIN NEUER WEG DER ELEKTRONISCHEN PATIENTENÜBERWACHUNG IN DER NEUGEBORENIENINTENSIVPFLEGE - Frank H.-D. - Abt. Neonatol. Intensivpflege, Kinderklin., Freie Univ., Berlin GFR - MEDIZINTECHNIK 1979 99/1 (26-28) - summ in ENGL

A computer assisted statistical technique for predicting future events from exponentially weighted past data has been developed to monitor and trend-

analyze fast-changing vital parameters in acutely ill neonates. The technique represents a modification and extension of industrial process control methods and recent similar applications in adult medicine. Initial use of the Real Time Trend Analysis program to severely ill but stable neonates made evident the need for a preprogram to establish contemporary and individualized mean, upper and lower values for the parameter being monitored. The system is pre-set to alarm when the parameter condition factor (CF) violates a consciously chosen percentage of deviation downward (deterioration) from the ideal value.

3700. An adaptive algorithm for noise rejection -

Lovelace D.E. and Knoebel S.B. - Krannert Inst. Cardiol., Dept. Med., Indiana Univ. Sch. Med., Indianapolis, Ind. USA - MED. INSTRUM. 1978 12/6 (334-336)

12:334-336, 1978.- An adaptive algorithm for the rejection of noise artifact in 24-hour ambulatory electrocardiographic recordings is described. The algorithm is based on increased amplitude distortion or increased frequency of fluctuations associated with an episode of noise artifact. The results of application of the noise rejection algorithm on a high noise population of test tapes are discussed.

9.6. Drug treatment

3701. Process interface for an artificial endocrine

pancreas (Germ) - PROZESZ-INTERFACE FÜR EIN KUNSTLICHES ENDOKRINES PANKREAS - Naegele R. and Kruse-Jarres J.D. - Klin. Chem. Lab. Chir., Univ. Klin., Freiburg i.Br. GFR - MEDIZINTECHNIK 1979 99/2 (67-70)

A computer induced monitor has been developed that regulates the blood glucose (artificial endocrine pancreas 'aep'). The reliability in service, the supervision of as many functions as possible, and a manual direct intervention in case of need are the main premises when put into clinical action. Due to these conditions a process interface has been constructed that is able to deal with all mentioned demands and that functions as intersection between the 'aep' and the operator. The functions of an artificial endocrine pancreas and the purpose of its interface in particular, its chart and its mode of action are described in detail.

9.7. Radiology

3702. Studies of the traumatic subdural hygroma in computed tomography (Japa) - Tanikake T., Kinugawa K., Kawamura K. et al. - Dept. Neurol. Surg., Nara Med. Univ., Nara JPN - J. NARA MED. ASS. 1978 29/2 (411-418) - summ in ENGL

Five cases of the traumatic subdural hygroma in adult were investigated by means of a Computed Tomography (CT) scan. Different diagnosis and follow up studies were discussed. The following results were obtained: Subdural hygroma can be diagnosed with CT scan only; Characteristic findings of the hygroma in CT scan are specified location, Emi-number, figure of low density area and any other; Surgical treatment is so effective that early operation is indicated for this symptom.

3703. Computed tomography of the pancreas (Japa) - Wakabayashi A., Saito S., Saeki M. et al. - II Dept. Med., Osaka Med. Coll., Osaka JPN - JPN. J. GASTROENT. 1978 75/8 (1260-1267) - summ in ENGL

Computed tomograms (CT) were studied in 59 control subjects, 38 patients with chronic pancreatitis, 10 patients with pancreatic tumor and 2 patients with pancreatic cyst, (total 109 patients). The ratio of the largest width of the pancreas to the width of the vertebral body (P/V) was 0.60 ± 0.10 in the head, 0.55 ± 0.08 in the body and 0.54 ± 0.09 in the tail of the normal pancreas (mean \pm SD), which appeared as a rod-like organ with homogenous density. The diameter of the pancreatic tumor permitting confirmation by $P/V > 0.80$ appears to be above 3.0 cm. In small or diffuse pancreatic cancer, P/V is normal, and unbalanced shape of the pancreas and inhomogenous density of the tumor represent important findings. In cancer of the head of the pancreas, cholestatic findings such as the dilated gallbladder should be emphasized. In malignant pancreatic cysts, unlike the benign cyst, the inside of the cyst is irregular and the internal density is inhomogenous. In chronic pancreatitis, CT is useful for detecting pancreatic calcification. CT is capable of confirming stones in the pancreas and permits a clearer demonstration of the shape and distribution of the stone than simple X-ray film of the abdomen.

3704. Computed tomography of the lung - Rosenblum L.J., Mauerci R.A., Wellenstein D.E. et al. - Dept. Radiol. Upstate Med. Cent., Syracuse, N.Y. 13210 USA - RADIOLOGY 1978 129/2 (521-524)

Preliminary work has shown that normal lungs have predictable CT patterns and density ranges. In emphysema, there are irregular zones of extremely low density as well as an overall low mean density. CT appears to have considerable potential for early detection of pulmonary emphysema and characterization of the degree of involvement. CT can also be useful in the study of physiological phenomena such as regional blood flow.

3705. Comparison of whole lung tomography and computed tomography for detecting pulmonary nodules

- Muhm J.R., Brown L.R., Crowe J.K. et al. - Dept. Diagn. Radiol., Mayo Clin., Rochester, Minn. 55901 USA - AM. J. ROENTGENOL. 1978 131/6 (981-984)

Detecting pulmonary metastasis is important when planning surgical therapy, radiotherapy, or chemotherapy in patients with known malignancy. A series of 91 patients was studied by both whole lung tomography and computed tomography (CT) of the lungs. More pulmonary nodules were detected with CT than with whole lung tomography in 32 (35%) of the patients. Of the 91 patients in the study, 31 had resection of some or all of the pulmonary nodules. In 27 patients, the nodules were primary or metastatic malignant lesions. Bilateral pulmonary nodules were detected with CT in 13 patients when whole lung tomography had demonstrated nodules in only one lung. CT has replaced whole lung tomography as the method preferred by the authors for detecting pulmonary nodules in selected patients at risk to

3706. Radiologic aspects of hepatic echinococcosis - Ramos Gonzalez L. Marcos J., Illanas M. et al. - Radiodiagn. Serv., Puerta de Hierro Soc. Security, Med. Sch. Univ. Auton. Madrid ESP - RADIOLOGY 1979 130/1 (21-27)

Over 5 years, 105 patients with hepatic echinococcosis were studied. Plain radiographs of the hepatic area yielded the correct diagnosis in 35% of patients. Intravenous viscerograms were diagnostic in all but 14 of the patients (an accuracy of 83%). Computed tomography was performed in 19 cases and proved the most efficient of the techniques: it was diagnostic in all 19 cases. The radiological signs of this entity are discussed.

3707. Evaluation of intracranial space-occupying lesions by computed tomography and electroencephalography. A comparison - Culebras A., Henry C.E. and Williams G.H. Jr. - VA Hosp., Syracuse, N.Y. 13210 USA - CLEVELAND CLIN. Q. 1978 45/3 (275-280)

Excluding subtentorial and extra-axial lesions, where the EEG in particular tended to fail or be nonlocalizing, CT failed in only six of 97 lesions. EEG failed in ten, with another ten instances in which the record was abnormal, but without clear localizing significance. Nevertheless, taken together, definite diagnostic findings were obtained on all 97 patients when the CT and EEG data were combined. CT provides excellent information on the location of mass lesions, structural distortion of neighboring regions and the extension of edema. It also distinguishes between more than one independent lesion, as in metastases. The EEG may suggest the location of the tumor, but in most cases it cannot discern among several masses and does not give direct information on the presence of perilesional edema. On the other hand, the EEG shows the amount and extension of functional distortion, which in many instances is larger than the strictly anatomic involvement. It also furnishes knowledge on certain functional peculiarities of the space-occupying lesion, most important of all its paroxysmal activity. Judiciously used, each of these noninvasive procedures complements the others in the initial evaluation of the patient suspected of harboring an intracranial space-occupying lesion. It is anticipated that with new developments in CT scanning, some of the above-reported failures will be averted.

3708. Reappraisal of the cost-effectiveness of computed tomography in a government-sponsored health care system - Wortzman G. and Holgate R.C. - Div. Neuroradiol., Toronto Gen. Hosp., Toronto, Ontario CAN - RADIOLOGY 1979 130/1 (257-261)

The economic effects of operation of a CT scanner in a neuroscience unit are re-evaluated. Reallocation of costs within the health care program is still possible but is presently curtailed by budgeting policies and restrictions. The answer lies in proper use of all neuroradiological procedures under the direction and control of the physician, regional health councils, hospital administrators, and government. K 16.05

3709. Computed tomography of the paranasal sinuses

and face: Part I. Normal anatomy - Hesselink J.R., New P.F.J., Davis K.R. et al. - Dept. Radiol., Massachusetts Gen. Hosp., Boston, Mass. 02114 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/5 (559-567)

With the ability to image both bone and soft tissue structures, computed tomography (CT) is capable of visualizing many normal anatomical structures of the paranasal sinuses and face not seen with other radiological techniques. The superficial and deep fat planes, all of the muscles of mastication, and many of the facial muscles are readily identified. The extraocular muscles, optic nerves, and globes are clearly seen. The purpose of this report is to review the normal anatomy of the paranasal sinuses and face imaged by CT in both the transverse and coronal planes.

3710. Evaluation of laryngeal cancer by computed tomography - Archer C.R., Friedman W.H., Yeager V.L. and Katsantonis G.P. - Dept. Radiol., St Louis Univ. Sch. Med., St Louis, Mo. 63104 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/5 (618-624)

Six cases of laryngeal cancer have been examined by computed tomography. The findings were correlated with those obtained by laryngoscopy and in 5 cases by pathological examination of the surgical specimens. Computed tomography accurately delineated the extent of tumor involvement of the laryngeal and paralaryngeal soft tissues. The diagnosis of involvement of the laryngeal cartilages presents some problems, which are discussed.

3711. Intraventricular hemorrhage in blunt head trauma - Oliff M., Fried A.M. and Young A.B. - Dept. Diagn. Radiol., Univ. Kentucky Med. Cent., Lexington, Ky. 40506 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/5 (625-629)

A series of 200 computed tomography (CT) scans performed for blunt head trauma was reviewed. Six patients were found to have clearly definable intraventricular hemorrhage (IVH); in 3 cases no other CT abnormality was noted. Computed tomography represents the only noninvasive method of detecting IVH, and the incidence of this entity has not previously been studied. Future attention to this problem may well demonstrate an even higher incidence, and establishment of its prognostic significance in trauma will be of considerable value. Scanning in the immediate posttrauma period is crucial.

3712. Computed tomography diagnosis of mesenteric masses - Bernardino M.E., Jing B.S. and Wallace S. - Dept. Diagn. Radiol., M.D. Anderson Hosp. Tumor Inst., Univ. Texas Syst. Cancer Cent., Houston, Tex. 77030 USA - AM. J. ROENTGENOL. 1979 132/1 (33-36)

The computed tomographic findings of 30 mesenteric masses are presented. To delineate the mesentery accurately, oral contrast material must fill the entire small bowel. Of the masses, 23 were secondary to non-hodgkin's lymphoma. These masses were irregular in shape and homogeneous in their tissue attenuation. Two of the 23 had a normal

lymphangiogram in the upper paraaortic area. Both lymphangiography and CT were necessary to define the extent of disease in such patients. The six mesenteric metastases were irregular in shape. Four of these had areas of decreased attenuation eccentrically located within the mass which may be secondary to necrosis. One mesenteric cyst had a circular shape with smooth, sharp borders, and a centrally located area of decreased attenuation.

3713. Diagnostic value of CT cisternography with intrathecal metrizamide enhancement (Japan) -

Hiratsuka H., Oie K., Yamaguchi T. et al. - Dept. Neurosurg., Tokyo Med. Dent. Univ., Tokyo JPN - NEUROL. MED.-CHIR. 1978 18II/3 (231-238) - summ in ENGL

The authors have studied the diagnostic value of computed tomography cisternography in the evaluation of altered CSF dynamics and lesions which affects the morphology of the basal cisterns, such as extraaxial tumors in 35 patients. Twenty-two patients received metrizamide for the evaluation of CSF dynamics, mainly of communicating hydrocephalus, 9 of skull base tumors such as pituitary adenomas and CP angle tumors, and 4 for congenital cystic lesions such as porencephaly or arachnoid cyst. Diazepam or phenobarbital was used before intrathecal injection of metrizamide. In most cases, metrizamide was introduced through the lumbar intrathecal route, except for 2 cases which were through cisterna magna puncture and 2 cases into the lateral ventricles via Ommaya's reservoir. Two to 10 ml of metrizamide solution with a concentration of 170 mgI/ml was used. The patients were kept in 30 degrees Trendelenburg position, or kept in the horizontal supine position. Computed tomography with EMI scanner (CT1010) was performed 1,3,6,24,48 hours and occasionally 72 hours after the injection. In normal CSF dynamics, basal cisterns are clearly visualized one hour after injection. At 3 hours, cisterns are more clearly opacified with metrizamide. At 6 hours, the amount of metrizamide is slightly decreased from basal cisterns. Sylvian and interhemispheric fissures and convexity subarachnoid spaces and sulci become more distinctly opacified. At 24 hours, basal cisterns become almost free of metrizamide diffuse increased absorption of the cerebral surface and possible cerebral parenchyma are noted. At 48 hours, no metrizamide is detected by CT. The fourth ventricular filling is sometimes seen in normal cases. In abnormal CSF flow pattern, ventricular reflux metrizamide, persistent or transient, is noted. In such cases, periventricular low density area is often observed on plain CT. In a case, periventricular low density area shows statistically significant increase in Hounsfield units at 6 and 24 hours, after metrizamide injection. This suggests periventricular resorption of metrizamide. The site of cisternal block is clearly visualized. Delayed convexity flow is also noted. Detailed morphology of the subarachnoid cisterns can be analysed with the use of CSF enhancement with metrizamide, especially by the 320x320 matrix high definition picture. The presence or absence of suprasellar extension of a tumor is exactly diagnosed. A CP angle tumor is also diagnosed as a filling defect. An arachnoid cyst and

porencephalic cyst can be diagnosed in relation with CSF flow pattern.

3714. Comparison of computer tomography with ultrasound in renal disease (Germ) - VERGLEICH COMPUTERTOMOGRAPHIE UND ULTRASCHALL BEI NIERENERKRANKUNGEN -

Baert A.L., Marchal G., Wilms G. and Van Dooren W. - Dienst Radiol., Akad. Ziekenh. St Rafael, Leuven BEL - RONTGEN BL. 1978 31/12 (641-645) - summ in ENGL

The following has been established in examinations under optimal conditions: Ultrasound and CT scan appear to be of equal value in respect of validity and significance of information on the nature of findings, especially in connection with space occupying processes, hydronephrosis and pyonephrosis. However, CT supplies a better anatomic and topographic overall view of the situation. CT scanning is definitely superior with respect to the significance of information on the extension and behaviour with respect to neighbouring organs. This is particularly evident in the visualisation of relapses after hyponephromas and in perirenal processes. Computer tomography is clearly superior in the identification of renal aplasias and hypoplasias.

3715. Considerations in diagnosing brain abscess with computerized axial tomography -

Heath L.K., Goldstein E. and Dublin A. - Sect. Infect. Dis., Dept. Int. Med., Univ. California, Davis, Calif. 95616 USA - ARCH. INTERN. MED. 1978 138/4 (628-629)

4 Studies with computerized axial tomography (CT scan) were performed in a 20-year-old man in whom multiple brain abscesses developed while hospitalized for complications of regional enteritis. A large frontal lobe abscess appeared as a nonspecific region of decreased density on the initial CT scans. When iodine was used to enhance the diagnostic sensitivity of the CT scan, this area was identifiable as an abscess. However, a 1-cm lesion in the right parietal area that extended into the choroid plexus was not delineated. Radionuclide scans detected both lesions, but did not allow pathological identification. The authors conclude that CT scans should be performed with iodine enhancement whenever brain abscesses are suspected, and that some abscesses that are undetected by CT scans even with iodine enhancement may be delineated but not identified by sodium pertechnetate Tc 99m imaging.

3716. Computed tomography of the head: Clinical experience of the first 3000 scans with EMI scanner -

Inaba Y., Hiratsuka H. and Komatsu K. - Dept. Neurosurg., Sch. Med., Tokyo Med. Dent. Univ., Tokyo JPN - BULL. TOKYO MED. DENT. UNIV. 1978 25/3 (157-164)

Computed tomography (CT) findings obtained from the first 3,000 scans on 2,031 patients were analyzed and discussions were made on various kinds of neurological diseases, especially from the neurosurgical point of view. CT showed an excellent resolution for three-dimensional morphological pattern of intracranial lesion with a high percentage of diagnostic accuracy as reported from other institutes, resulting in making much earlier morphological diagnosis of

intracranial lesion possible than any other examination. Scan methods consisted of plain CT, contrast enhanced CT, and metrizamide CT cisternography. Sequential delayed enhanced CT offered more useful information for high diagnostic accuracy, particularly for nature of brain tumor. Metrizamide CT cisternography was performed for the evaluation of cerebrospinal fluid dynamics and diagnosis of skull base tumors. CT is a new, epoch-making and non-invasive diagnostic approach in neuroradiology and contributes to obtain the better achievement of neurosurgical results.

3717. Computed tomographic diagnosis of osteomyelitis

- Kuhn J.P. and Berger P.E. - Dept. Radiol. Nucl. Med., Child. Hosp., Buffalo, N.Y. 14222 USA - RADIOLOGY 1979 130/2 (503-506)

Computed tomography (CT) was performed in conjunction with conventional radiography and radionuclide imaging in 22 children with known or suspected osteomyelitis. Preliminary findings suggest that when radionuclide scans are positive, CT can exclude or establish medullary involvement, differentiate between overlying soft-tissue and underlying bony abnormality, and clearly delineate the anatomy of the soft tissues.

3718. Computed tomography of the cervical spine and spinal cord - Gonsalves C.G., Hudson A.R., Horsey W.J. and Tucker W.S. - Dept. Radiol., St Michael's Hosp., Toronto, Ontario W5B 1W8 CAN - COMPUT. TOMOGRAPHY 1978 2/4 (279-293)

A number of cases are presented to illustrate the diagnostic effectiveness of computed tomography in the cervical spine and spinal cord, specifically in syringomyelia, spinal stenosis, and fractures. Certain limitations in the examination are also presented, and problems related to interpretation, particularly in regard to spinal stenosis, are discussed.

3719. The use of CT scanning in resolving 'pseudo' lesions of the liver - Morgan C.L., Trought W.S. and Daffner R.H. - Dept. Radiol., Duke Univ. Med. Cent., Durham, N.C. 27710 USA - COMPUT. TOMOGRAPHY 1978 2/4 (295-301)

The interposition of bowel, fat, or ascitic fluid between the liver and abdominal wall may suggest the presence of a space occupying lesion on a radionuclide scan. The authors report on the use of computerized tomography as well as ultrasound for resolving the problem created by these 'pseudo' lesions.

3720. Present day development of the Paris system.

First part: coplanar patterns and those called 'in squares' (Fren) - DEVELOPPEMENT ACTUEL DU SYSTEME DE PARIS. PREMIERE PARTIE: LES DISPOSITIFS COPLANAIRES ET LES DISPOSITIFS DITS 'EN CARRES' - Marinello G., Dutreix A., Pierquin B. and Chassagne D. - Serv. Carcinol. Radiother., Hop. Henri-Mondor, Creteil FRA - J. RADIOL. ELECTROL. MED. NUCL. 1978 59/11 (621-626) - summ in ENGL

The Paris System is a previsualisation dosimetric system which facilitates the work of curietherapists working with iridium 192 wires. Introduced about twelve years

ago for radioactive implantations in one linear plane, this system has now become more generalized for implantations in two or more linear planes. After a brief review of the principles on which the Paris System is based, and introducing the new definitions arising from its development, the authors present the results of a systematic computerized study. The results obtained were used to establish, among others, the simple relationships between the geometric implantation data (disposition, length, number and separation of the radioactive lines) and the dimensions of the volume treated, for the coplanar patterns and those called 'in squares'.

3721. The importance of whole body computer tomography in radiotherapy of malignant thoracal tumors (Hung) - Schnabel K., Hermann H.J. and Vargha Gy. - Dtsch. Krebsforsch. Zent., Inst. Nukl. Med., Heidelberg GFR - MAGY. ONKOL. 1978 22/4 (227-236) - summ in ENGL, RUSS

The authors deal with the role of whole body tomography (CT) in radiotherapy. Experiences, acquired by CT in course of radiotherapy of malignant thoracal tumors are presented and they are illustrated by 8 cases. The advantages of CT are emphasized in the tumor stadium determination (carried out according to the exact TNM system) in planning of irradiation, as well as in the course of therapy and the subsequent control. According to the authors the high energy radiotherapeutic centers have to get the opportunity to carry out the tumor therapy by the help of modern whole body CT.

3722. Comparative cranial CT enhancement in a primate model of cerebral infarction - Drayer B.P., Dujovny M., Wolfson S.K. Jr. et al. - Dept. Radiol., Univ. Pittsburgh Sch. Med., Pittsburgh, Pa. USA - ANN. NEUROL. 1979 5/1 (48-58)

The value of various enhancement techniques as opposed to nonenhanced CT scanning was compared in 15 baboons with cerebral infarction secondary to embolization of the left middle cerebral artery. The most prominent CT findings in infarction included an area of low absorption in the opercula-basal ganglia-centrum semiovale region and generalized lateral ventricular enlargement. Intravenous enhancement of the low-density region occurred in 25% of the animals and often obscured the preenhancement abnormality. However, a rapid bolus injection of contrast material followed by immediate consecutive CT scans (computed angiotomography) permitted prominent visualization of early-shunting veins. Delayed scanning following intrathecal enhancement better defined small infarctions that did not exhibit the usual cerebral blush. The CT imaging of inhaled xenon provides a new technique for evaluating subtle abnormalities in cerebral perfusion, even when the routine CT scan shows no abnormality.

3723. Infantile spasms associated with subdural lesions. A study by computed tomography (Japa) - Onuma A., Takamatsu N., Iinuma K. et al. - Dept. Ped., Nagamachi Branchi Hosp. Sch. Med., Tohoku Univ., Sendai JPN - BRAIN DEVELOP. (TOKYO) 1979 11/1 (35-44) - summ in ENGL

It is said that chronic subdural hematoma or effusion is one of the causes of infantile spasms and is a surgically treatable lesion in infantile spasms. The authors studied 22 new cases of infantile spasms, in infants aged 2 mth to 30 mth, from February 1976 to January 1978. Computed tomography (CT) was carried out in all 22 cases, especially in search for subdural lesions. CT revealed extracerebral accumulations in 7 cases. Two of these 7 cases were diagnosed by cisternography as having primary brain atrophy. The other 5 cases were diagnosed as having subdural lesions: thereafter craniotomies were carried out. In 3 of the 5 cases, subdural lesions were confirmed by craniotomy. One case who had previously suffered from purulent meningitis was found to have an accumulation of cerebrospinal fluid in the subarachnoid space resulting from bilateral frontal lobe necrosis, and the last case was found to have a thickened subarachnoid membrane and enlargement of the subarachnoid space.

3724. Electroencephalography in brain edema (127 cases of brain tumor investigated by cranial computerized tomography) - Gastaut J.L., Michel B., Hassan S.S. et al. - Serv. Neuropsychiol. Clin., Groupe Hosp. Timone, 13385 Marseilles Cedex 4 FRA - ELECTROENCEPHALOGR. CLIN. NEUROPHYSIOL. 1979 46/3 (239-255) - summ in FREN

Cranial computerized tomography (CCT) in permitting visualization of cerebral edema in live patients, allows for the first time valid studies concerning the role of reactional edema in the generation of EEG abnormalities related to expanding processes. The authors analyze the results of EEG and CCT in 127 patients presenting cerebral tumor(s), 84 of which were accompanied by reactional edema. The study leads to the conclusion (also demonstrated by certain animal work) that edema per se is only rarely responsible (9.5%) for the EEG abnormalities.

3725. Dual kilovoltage at computed tomography: a prereconstruction method for estimation of effective atomic number and electron density - Marshall W.H. Jr., Alvarez R., Macovski A. et al. - Stanford Univ. Sch. Med., Stanford, Calif. 94305 USA - NEURORADIOLOGY 1978 VOL. 16 (605-606)

Some of the prior efforts at using postreconstruction dual kilovoltage CT scans to obtain an effective atomic number and electron density are reviewed. A prereconstruction method which avoids beam hardening is applied to a phantom and a beginning clinical trial is described.

3726. Stereotactic computer tomography for biopsy of gliomas - Lewander R., Bergstrom M., Boethius J. et al. - Dept. Diagn. Radiol., Huddinge Sjukh., S-141 86 Huddinge SWE - ACTA RADIOL. SER. DIAGN. 1978 19/6 (867-888) - summ in GERM, FREN

A technique is introduced enabling automatic transfer of coordinates obtained at computer tomography into a stereotactic system previously applied in biopsies of brain lesions. Four to five biopsies from different parts of gliomas were taken to compare the structures demonstrated on computer

tomography with the microscopic appearances. Of 45 biopsies in 13 patients, 36 were predicted correctly. This also served as an attempt to classify gliomas on the basis of their appearance in the CT image.

3727. Computerized fluoroscopy in real time for noninvasive visualization of the cardiovascular system - Kruger R.A., Mistretta C.A., Houk T.L. et al. - Dept. Radiol., Univ. Wisconsin, Madison, Wis. 53706 USA - RADIOLOGY 1979 130/1 (49-57)

A computerized fluoroscopic system with dedicated real-time hard-wired algorithms can be used for cardiovascular imaging with or without injection of iodine. Initial differentiated and integrated time subtraction displays are presented. Contrast studies appear adequate for visualization of cardiovascular dynamics. Cardiac images without contrast material suggest expected blood flow patterns but are difficult to interpret.

3728. Functional anatomy of the cerebral cortex by computed tomography - Gado M., Hanaway J. and Frank R. - Edward Mallinckrodt Inst. Radiol., Washington Univ. Sch. Med., St Louis, Mo. 63110 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (1-19)

The authors describe the morphological characteristics that allow recognition of the individual computed tomography slice and determine its sequence in the series. In addition, each slice is 'assembled' by defining the different cortical gyri, sulci, and cortical functional areas (based on Brodmann's maps). The work lays the foundation for correlative studies of location of lesions and the clinical picture.

3729. Computed tomography of calcified liver metastases - Bernardino M.E. - Univ. Texas Syst. Cancer Cent., M.D. Anderson Hosp. Tum. Inst., Houston, Tex. 77030 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (32-35)

The computed tomography findings of 6 patients with calcified liver metastases are presented. The significance of this finding in patients with unknown primary malignancies or after multiple courses of chemotherapy is stressed.

3730. Computerized tomography of the eye: A study of 62 pathologic cases - Aubin M.L. and Vignaud J. - Dept. Radiol., Fond. Ophtalmol. A. de Rothschild, F-75019 Paris FRA - NEURORADIOLOGY 1978 VOL. 16 (456-457)

The usefulness of CT of the eye in diagnosis is discussed, and comparison with ultrasonography is made. The authors draw on experience with 62 patients, including, in particular, cases of tumor, eyeball malformation, and intraocular foreign bodies. CT is not very useful for study of the eyeball itself, but can be indispensable in the diagnosis of malformations and tumors.

3731. The value of computed tomography in delineating suprasellar extension of pituitary adenomas - Pripstein S., Danoff B., Schnapf D. et al. - Thomas Jefferson Univ. Hosp., Philadelphia, Pa. 19040 USA - NEURORADIOLOGY 1978 VOL. 16 (462-463)

Pituitary tumors commonly produce suprasellar extension. We have found that in assessing lateral suprasellar extent, the pneumoencephalogram and arteriogram are least accurate. CT scanning significantly increases the accuracy, and it is recommended that all patients with pituitary tumors have an initial CT scan.

3732. Cerebrospinal fluid scintigraphy and computer assisted tomography in the evaluation of special kinds of hydrocephalus in children - Piepgras U., Huber G. and Emde H. - Dept. Neuroradiol., Univ. Hosp., Univ. Saarland, Homburg-Saar GFR - **NEURORADIOLOGY 1978 VOL. 16 (74-75)**

CT cisternography and CSF scintigraphy are indispensable in the detailed morphologic and etiologic evaluation of special types of childhood hydrocephalus. In addition these investigations afford interesting insights into CSF dynamics in apparently complete membranous or tumorous obstruction of the fourth ventricle and into the genesis of internal hydrocephalus in cerebellopontine angle tumors.

3733. Cervical myelography with metrizamide (Amipaque). A comparison between conventional and computer-assisted myelography with special reference to the upper cervical and foramen magnum region - Skälpe I.O. and Sortland O. - Sect. Neuroradiol., X-ray Dept., Nat. Hosp. Norway, Oslo NOR - **NEURORADIOLOGY 1978 VOL. 16 (275-278)**

Cervical myelography with metrizamide was performed in a series of 30 patients. Minor modifications to the conventional technique made it possible to carry out measurements of the sagittal diameter of the cord and to improve the opacification of the upper cervical-foramen magnum region. Computer tomography was performed with a head scanner within 1 h after the conventional examination, and the spinal cord surrounded by contrast medium was shown from C-3 to the foramen magnum region. Measurements of the sagittal diameter of the spinal canal and the cord at corresponding levels using the two methods showed good correlation.

3734. Interobserver variability in CT reporting. A comparative evaluation (Germ) - INTERBEOBACHTER-UBEREINSTIMMUNG IN DER CCT-BEFUNDUNG. EINE VERGLEICHENDE STUDIE - Rienhoff O., Stoeppler L., Grunwald F. et al. - Arbeitsgruppe Craniale Computertomographie, Abt. Neuroradiol., Med. Hochsch., D-3000 Hannover 61 GFR - **NEURORADIOLOGY 1978 VOL. 16 (322-323) - summ in ENGL**

Within a test of interobserver variability 88 CCT images were described by 4 physicians. In spite of a standardized documentation method, first results demonstrate that continuous quality control is necessary if the data is gathered into CCT data bases. The evaluation of uncontrolled data seems to be limited.

3735. A new approach to the smoothing of dynamic nuclear medicine data: Concise communication - Yuille D.L. - Letterman Army Med. Cent., San Francisco,

Calif. 94129 USA - **J. NUCL. MED. 1978 19/7 (836-844)**

A weighted three-dimensional digital filter that smooths data in both space and time has been developed for use with dynamic nuclear medicine studies. This smoothing algorithm allows a large improvement in signal-to-noise ratio without unacceptable degradation of spatial and temporal resolution. The initial results of using this smoothing algorithm suggest that it is superior to a standard nine-point smoothing function used on dynamic data. This is particularly encouraging since the parameters of the digital filter have not been optimized. The quality of the processed digital images is at least equivalent to that of analog images, and the digital images may be of more diagnostic value. The new algorithm also appears useful in preparing dynamic data for other manipulations such as the creation of parametric images or the extraction of quantitative measurements.

3736. The appearance of an anomalous azygos vein on computed tomography of the chest - Kolbenstvedt A., Kolmannskog F. and Aakhus T. - Dept. Diagn. Radiol., Rikshosp., Oslo NOR - **RADIOLOGY 1979 130/2 (386)**

Computed tomography of the chest for possible pulmonary lesions in a patient with an azygos lobe of the right lung demonstrated the anomalous azygos vein. In an isolated CT section, the anomalous vein may simulate a pulmonary lesion, however, this can be explained by the presence of an azygos lobe.

3737. Computed tomography in the staging of testicular neoplasms - Lee J.K.T., McClennan B.L., Stanley R.J. and Sagel S.S. - Mallinckrodt Inst. Radiol., Washington Univ. Sch. Med., St Louis, Mo. 63110 USA - **RADIOLOGY 1979 130/2 (387-390)**

Twenty-six patients with primary testicular tumor were evaluated by computed tomography. It was highly accurate in differentiating lymph node metastases from testicular tumors. CT scanning may reveal tumor in lymph nodes not normally opacified during bipedal lymphangiography. It can also be used in treatment planning, follow-up and in localizing sites of recurrence when serum tumor markers become positive. Some pitfalls of CT are also discussed.

3738. The relation of liver fat to computed tomography numbers: A preliminary experimental study in rabbits - Ducommun J.-Cl., Goldberg H.I., Korobkin M. et al. - Dept. Radiol., Univ. California Sch. Med., San Francisco, Calif. 94143 USA - **RADIOLOGY 1979 130/2 (511-513)**

The relation of liver fat content to CT number was studied in 20 rabbits (17 experimental, 3 control) where fatty degeneration was produced by carbon tetrachloride (CCl₄) ingestion. Liver scanning was performed before and 2-5 days after CCl₄ administration. Changes (decrease) in CT number were compared with triglyceride (TG), water and protein content of resected livers. A decrease of 12-20 CT number (24-40 H) reflected at TG concentration of 20-40 mg/g.

3739. Computed tomographic diagnosis of pseudoascites

(floating viscera syndrome) - Shin M.S., Ferrucci J.T. Jr. and Wittenberg J. - Dept. Radiol., Massachusetts Gen. Hosp., Boston, Mass. 02114 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/5 (594-597)

Two cases of excessive fat deposition in the abdomen, confused clinically as massive ascites, are reported. Computed tomography (CT) has proven useful in making a definitive diagnosis of fat deposition in the abdominal and retroperitoneal space and has made further clinical studies unnecessary. No prior cases of pseudoascites (floating viscera syndrome) have been reported in the radiologic literature despite the specificity of CT diagnosis.

3740. Computerized transverse axial scanning in the diagnosis of presenile dementia (Japa) - Yuri K. - Dept. Neuropsychiat., Kansai Med. Univ., Moriguchi, Osaka JPN - J. KANSAI MED. UNIV. 1978 30/1 (85-96) - summ in ENGL

The author has been studying degenerative changes of the brain in the case of presenile dementia with the aid of computerized transverse axial scanning (computed tomography) since 1976. In this paper the clinical features and evolutions of seven patients with presenile dementia are reported, of whom two were diagnosed as Pick's disease and five as Alzheimer's disease exclusively from the clinical viewpoint, with reference to Polaroid pictures of computed tomographic print-outs. At the same, their results have been compared with those regarded as normal and with one diagnosed as senile dementia. In the case of Pick's disease, marked enlargement of the ventricular system was found in the two cases, particularly in the anterior portions, while in the cases of Alzheimer's disease, such an enlargement was only seen in two cases. The two cases of Alzheimer's disease showed a generalized enlargement of the ventricular system and slight enlargement of the cerebral sulci, while the other three cases presented no marked enlargement of the ventricular system. There was enlargement of the cerebral sulci and fissures. The patient with senile dementia showed moderate enlargements of cerebral sulci, fissures and ventricular system, which were seen in one of the latter three patients with Alzheimer's disease. It is of particular interest that the two patients with Alzheimer's disease with general enlargement of the ventricular system have been differentiated from the other three on the basis of different clinical features, whether or not there were specific local syndromes of the brain such as aphasia, agnosia and apraxia. Actually, computed tomography is quite useful in the clinical diagnosis of presenile dementia.

3741. Computed tomography of arachnoid cysts - Leo J.S., Pinto R.S., Hulvat G.F. et al. - Dept. Radiol., New York Univ. Med. Cent., New York, N.Y. USA - RADIOLOGY 1979 130/3 (675-680)

The typical CT appearance of intracranial arachnoid cysts may obviate additional neuroradiological procedures. Ventriculography using water-soluble contrast media may differentiate a suprasellar arachnoid cyst from a dilated third ventricle. Twelve cases are presented.

3742. Computed tomographic arteriography of the liver -

Prando A., Wallace S., Bernardino M.E. and Lindell M.M. Jr. - Dept. Diagn. Radiol., Univ. Texas Syst. Cancer Cent., M.D. Anderson Hosp. Tumor Inst., Texas Med. Cent., Houston, Tex. USA - RADIOLOGY 1979 130/3 (697-701)

Computed tomographic arteriography (CTA) of the liver performed during intra-arterial infusion of contrast material improved the detection of hepatic lesions in 10 of 12 patients and was the only method that accurately determined the extent of disease in 6. This technique has significant advantages over conventional hepatic computed tomography with or without intravenous contrast enhancement, or selective hepatic angiography. It is recommended in the evaluation of selected patients, especially when there is a discrepancy between the findings obtained by other methods.

3743. Posttraumatic intracranial meningiomas: Recognition by computed tomography in three cases - Gardeur D., Allal R., Sichez J.P. and Metzger J. - Dept. Neuroradiol., Hop. Pitie, 75013 Paris FRA - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (103-104)

Intracranial meningiomas were detected by computed tomography (CT) in three patients who had suffered previous head trauma 40, 10, and 3 yr before. In two of the patients, the meningioma was located at the site of the traumatic impact and lesion. Meningiomas should be considered one of the late posttraumatic sequelae that can be recognized by CT.

3744. Computed tomography in a primate stroke model using selective balloon catheter arterial occlusion - Pevsner P.H. - Dept. Radiol., Med. Coll. Virginia, Richmond, Va. USA - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (105-108)

Ten heparinized nonhuman primates (rhesus monkeys and Papio maryumaya baboons) were subjected to temporary occlusion of an insular branch of the middle cerebral artery with a balloon catheter. An infarct was created. The lesions were monitored in vivo by computed tomography performed at intervals for 1 year. Animals were sacrificed and the lesions examined histologically. The technique obviates the disadvantages of surgical reaction, intravascular thrombosis, and gross cerebral edema observed in prior animal stroke models.

3745. Diagnosis of Pick's disease by computed tomography - McGeachie R.E., Fleming J.O., Sharer L.R. and Hyman R.A. - Dept. Radiol., North Shore Univ. Hosp., Manhasset, N.Y. 11030 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (113-115)

Pick's disease is a rare cause of dementia. It often shows a characteristic pattern of atrophy affecting primarily the anterior portions of the frontal and temporal lobes. This pattern, as shown by computed tomography, may suggest the diagnosis.

3746. Computer assisted tomographic evaluation of a ganglioneuroblastoma in an adult - Mannes E.J., Walsh J.W., Simeone J.F. and Putnam S.L. - Dept. Diagn. Radiol., Yale Univ. Sch. Med., New Haven, Conn.

A case of ganglioneuroblastoma in an adult is presented. The precise localization of the tumor mass with computer assisted tomography aided the planning of radiation therapy. In addition, follow-up scans allowed evaluation of tumor response to both radiation and chemotherapy. The clinical and radiologic characteristics of this unusual tumor are discussed.

3747. Renal oncocyoma - Wojtowicz J., Karwowski A., Konkiewicz J. and Lukaszewski B. - Inst. Radiol., Med. Sch., Poznan POL - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (124-125)

In a case of renal oncocytic adenoma, a 'spoke-wheel' pattern of pathological vessels was observed at arteriography of the highly vascular tumor. Computed tomography revealed a solid mass with attenuation value significantly higher than that of the normal renal tissue.

3748. Recognition of head motion during cranial computed tomography - Mano I. and Kaneko M. - Dept. Radiol., Hamamatsu Univ. Sch. Med., Hamamatsu-shi JAP - J. COMPUT. ASSISTED TOMOGRAPHY 1979 3/1 (128-131)

A television monitoring technique was developed to analyze patient head motion during cranial computed tomography (CT). The graphs recorded with this system, craniokymograms, are compared with simultaneous CT images. Two other applications of this system are shown with examples of experimental data.

3749. Contribution to the diagnosis of cortical atrophy: Evaluation of computer tomograms and angiograms of patients over 70 years old (Germ) - BEITRAG ZUR DIAGNOSE DER RINDENATROPHIE:

AUSWERTUNG VON COMPUTERTOMOGRAMMEN UND ANGIOGRAMMEN UBER 70 JAHRE ALTER PATIENTEN - Schindler E. and Ludwig B. - Abt. Neuroradiol., Univ. Klin., Mainz GFR - NEURORADIOLOGY 1978 VOL. 16 (183-186) - summ in ENGL

To find evidence of cortical atrophy, 112 computer tomograms and 40 angiograms of patients above the age of 70 were evaluated. In the CT the width of the interhemispheric and of the sylvian fissure, in the angiograms the distance between the vessels extending into the interhemispheric fissure (anteroposterior view) and the distance between the cortical branches and the inner table (lateral view) were measured. The same measurements were performed in 100 normal angiograms of patients between 20 and 40 years old. Statistically significant differences could be ascertained between the mean values for the patients over 70 and those for the younger ones, indicating that age-induced cerebral atrophy can be neuroradiologically demonstrated. The radiologic findings, however, do not necessarily correspond to the grade of intellectual impairment in the elderly. Neuropathologic and molecular biological research could bring them closer to the solution of this correlative problem.

3750. Computer analysis of periventricular lucency on the CT scan - Asada M., Tamaki N., Kanazawa Y. et al. - Dept. Neurosurg., Kobe Univ. Sch. Med., Kobe JPN - NEURORADIOLOGY 1978 VOL. 16 (207-211)

Of 53 patients with periventricular lucency, 70% revealed obstructive hydrocephalus, mainly due to infratentorial tumors, and the remainder were cases of communicating hydrocephalus, usually secondary to subarachnoid hemorrhage. Of the patients with PVL, 95% had hypertensive hydrocephalus and 60% showed slightly dilated ventricles. Computer analysis was helpful in displaying PVL objectively and clarifying its nature. In experimentally induced obstructive hydrocephalus, PVL was observed at the acute hypertensive stage. We concluded that the pathogenesis of PVL might be the passive diffusion or acute extravasation of CSF into white matter through the disrupted ventricular wall, rather than transependymal absorption of CSF.

3751. Physiologic changes in regional cerebral blood flow defined by xenon-enhanced CT scanning - Drayer B.P., Wolfson S.K., Boehnke M. et al. - Dept. Radiol., Univ. Pittsburgh Hlth Cent., Pittsburgh, Pa. USA - NEURORADIOLOGY 1978 VOL. 16 (220-223)

With adequate concentrations of commercially available nonradioactive xenon an enhancement of brain substance was readily demonstrated by computed tomography (CT). By performing successive CT scans at a fixed brain level following xenon inhalation, the partition coefficient and clearance of xenon as well as the regional cerebral blood flow (rCBF) could be calculated. The expected physiologic alterations in rCBF with acute cerebral infarction and changes in arterial CO₂ were accurately defined by xenon-enhanced CT scanning affirming the potential future applications of this technique.

3752. Evaluation of cartesian coordinates and radiation doses in points determined with stereo X-ray techniques - Storch P.R.M. and Van Kleffens H.J. - Computer Dept., Rotterdamsch Radio Therapeut. Inst., Dr. Daniel Hoed Klin., Rotterdam 3024 NLD - COMPUT. PROGRAMS BIOMED. 1979 9/2 (141-148)

A Fortran computer program STEV (stereo evaluation) is described. The principles of the stereo techniques together with the calculation method of the stereo coordinates are given briefly. The determination of the rectangular coordinates from mean stereo coordinates is described. Radiation doses in anatomical points, during intracavitary and interstitial radiation therapy, are calculated, taking into account a statistical evaluation of the measurement errors.

3753. A computer module for radiology registration and charging - Williams L.E. and Bose P.K. - Dept. Radiol., Univ. Minnesota, Minneapolis, Minn. USA - APPL. RADIOL. 1979 8/1 (41-45)

A large, multiple-task computer is probably the best facility for the logistic processing done by a radiology department. The cost of such a system can be minimized if the user is one of a group of subscribers to a common hospital processor. In this way, moreover, radiology can also more effectively communicate both patient-related and operations-related information

within the medical complex. A modular approach to the network concept allowed the University of Minnesota Department of Radiology to consider its functional operations in detail; some four departmental operations, along with the requisite computer modules, were defined. The logical need for registration information in all of these modules necessitated that the registration and changing system be developed initially. This module eliminated lost and late charges and allowed the periodic generation of specific tabulations. In addition, special study reports, using any of the patient parameters, could now be computer-printed upon request. Patient-history information became instantly accessible using the terminals placed in the department. One clerical position and a large mechanical power file were eliminated with a corresponding reduction in costs, noise levels, and overcrowding. The radiologists have found that a registration/charging module eliminates the need for individual case files. Recall of studies by protocol type or by American College of Radiology (ACR) code is now possible. Department planning has also been improved through the collection of statistical information as a function of referring service and time of day.

3754. Clinical and economical impact of computer-assisted diagnosis in nuclear medicine - Rose L. - Dept. Nucl. Med., Presbyterian-Univ. Hosp., Pittsburgh, Pa. USA - APPL. RADIOL. 1979 8/1 (142-144)

Computer-assisted diagnosis has been playing an increasingly important role in routine clinical procedures as well as for research purposes within nuclear medicine departments. Justification for employing a computer for these functions raises the question of the relative degree of improved patient care for the dollars spent. To answer this question, a survey questionnaire was developed and sent to 115 participants. Results of the survey indicate that acquisition of a computer system contributed to the improvement of patient care through more accurate interpretation of patient data. However, some disagreement on the usefulness of computer-assisted diagnosis in nuclear medicine still exists. The survey data indicate that the purchase cost of the computer system and the salaries of any additional personnel required as a result of computer use can be recovered with a minimal increase in patient charges.

3755. The relationship of computed tomography, Gray-scale ultrasonography and radionuclide imaging in the evaluation of hepatic masses - Petasnick J.P., Ram P., Turner D.A. and Fordham E.W. - Dept. Diagn. Radiol., Rush-Presbyt. St Luke's Med. Cent., Chicago, Ill. USA - SEMIN. NUCL. MED. 1979 9/1 (8-21)

Hepatic scintigraphy, gray-scale ultrasonography, and computed tomography have proven to be useful in the initial detection and evaluation of hepatic masses. These studies appear to be complimentary since each provides information not available from the others. Hepatic scintigraphy is currently the method of choice for the initial evaluation of the liver for mass lesions as it is easily performed, relatively inexpensive, and affords detectability of intrahepatic mass lesions at least as great as that of ultrasonography or computed

tomography. When a definite or suspected abnormality is seen by hepatic scintigraphy, computed tomography or ultrasonography may be helpful in providing better anatomic definition or clarification of the nature of the abnormality. The choice between these latter two modalities depends on the type of scanning equipment available and the observer's experience with each method.

3756. The use of computerized axial x-ray-tomography (EMI-scan) in ophthalmology (Germ) - DIE TOMODENSITOMETRIE IN DER AUGENHEILKUNDE - Bronner A., Kosmann P., Wackenheim A. and Ammerich H. - Univ. Augenklin., Strasbourg FRA - KLIN. MONATSBL. AUGENHEILKD. 1979 174/1 (5-12) - summ in ENGL

There now exist protocols for specific scanning which make it possible to obtain tranverse sections of a few millimetres in thickness of the orbits and their contents, with minimum sweep and with a very low dose of radiation for the lens. Normal scanner anatomical findings in the orbit may thus be defined for the eyeball (outer coats, vitreous, lens) as well as retrobulbar structures (optic nerve, oculomotor muscles in particular). Intraocular tumours (e.g. retinoblastoma) are visible on enlarged scan films. The value of scanning lies above all in the determination of the site, size and shape of orbital lesions and, where applicable, their relations with neighbouring extra- and intra-cerebral structures. In addition, certain conditions such as exophthalmos during hyperthyroidism have characteristic scan findings. It nevertheless remains difficult to attempt to predict a histological diagnosis on the basis of scan findings, the risk of a false positive being particularly significant. Particular emphasis must be placed upon the contribution of techniques of treatment of the films obtained (enlargement, contrast media, histograms, lateral views) as well as the complementary use of other methods of radiological investigation (in particular arteriography and phlebography) which scanning cannot replace but which it should usually precede since it is atraumatic and non-invasive.

3757. Computed tomography in a verified case of tuberculous meningitis - Arimitsu T., Jabbari B., Buckler R.E. and Di Chiro G. - Neuroradiol. Computed Tomography Sect., Nat. Inst. Neurol. Communicat. Disorders Stroke, NIH, Bethesda, Md. 20014 USA - NEUROLOGY 1979 29/3 (384-386)

In a verified case of tuberculous meningitis, postcontrast computed tomograms demonstrated enhancement of the area corresponding to the cistern surrounding the brainstem. This enhancement disappeared after successful drug treatment of the meningitis.

3758. Computed tomographic evaluation of para-aortic hematoma following translumbar aortography - Chuang V.P., Fried A.M. and Chen C.O. - Dept. Diagn. Radiol., Univ. Kentucky, Lexington, Ky. USA - RADIOLOGY 1979 130/3 (711-712)

Computed tomography provides an objective means of studying needle passage and paraaortic hematoma

formation following translumbar aortography (TLA). CT scans from the puncture site to the aortic entry site were done in 13 patients before and after catheter removal to evaluate the incidence and extent of hematoma formation. Eleven (87%) demonstrated para-aortic hematomas following TLA; 8 were confined to the left para-aortic area and 3 involved both sides. The catheter passed through the left kidney in one patient; however, no hematoma was observed.

3759. The radiation dose to patients from EMI brain and body scanners - Wall B.F., Green D.A.C. and Veerappan R. - Nat. Radiol. Prot. Board, Harwell, Oxon GBR - BR. J. RADIOL. 1979 52/615 (189-196)

Absorbed doses throughout the head of a Rando standard man phantom have been measured during simulated neurological examinations with the EMI Mk I brain scanner and the second generation CT 1010 brain scanner. Similar measurements have been made with the CT 5005 whole-body scanner which have also included scans through thoracic and abdominal sections of the phantom. Lithium borate thermoluminescent dosimeters placed at regular intervals throughout, and on either side of the scanned volume, have enabled estimates to be made of the total energy imparted to the phantom by each scanner as well as the absorbed dose at various locations including organs of interest in health physics such as the lens of the eye, thyroid and gonads. Isodose curves have been plotted for the central transverse section of each simulated examination. Results are reported for both the standard and high accuracy scan speed options on the 2 scanners where this choice is available. It would appear that all 3 machines when operated at their standard scan speeds impart no more energy to the phantom than that associated with a few conventional radiographs of the same part of the body. Maximum skin doses vary from 30 to 56 mGy (3.0 to 5.6 rad) being highest for the CT 1010 scanner. Use of the high accuracy scan option increases the energy imparted and the maximum skin doses by a factor of about 5, while providing much enhanced tissue density discrimination. In the case of the body scanner this higher value of energy imparted becomes comparable to that associated with lengthy fluoroscopic examinations like barium enemas. Recent work by EMI involving further refinements to the collimation system has reduced the dose levels by typically 50%. Some preliminary results with this new system are included to indicate the likely degree of improvement, but a detailed account will be the subject of a separate paper.

3760. An information system for a department of nuclear medicine (Germ) - EIN ABTEILUNGS-INFORMATIONSSYSTEM FÜR DIE NUKLEARMEDIZIN - Schumacher W., Frost D., Albrecht H.J. et al. - Abt. Strahlenther. Nukl. Med., Rudolf-Virchow-Krankenl., Berlin GFR - NUKL. MED. 1979 18/1 (1-6) - summ in ENGL

A computer system is connected on-line to each working place of a department for nuclear medicine. It is assisting the daily work such as the measuring and processing of the measured data, the medical interpretation of the results and the finding of the

diagnosis, and finally the composing and writing of medical reports. Additionally this system supports the organization of the department in many ways. The organization and functions of the system are described.

3761. Value of computerized tomography scanning in syndromes associated with mental retardation:

Preliminary report - Naheedy M.H. and Schnur J.A. - Dept. Radiol., Div. Neuroradiol., Harvard Med. Sch., Cambridge, Mass. USA - COMPUT.

TOMOGRAPHY 1979 3/1 (1-8)

The application of CT scanning in the evaluation of mental retardation syndromes is reviewed. In a representative sample of 35 institutionalized patients, the CT scan showed gross anatomic abnormality in most. However, these findings were diagnostic in only a small minority. Implications of this are discussed. In addition, the potential role of CT in the diagnosis of intercurrent diseases in the mentally retarded is considered.

3762. Computer assisted tomography in rapidly growing brain tumor - Rao K.C.V.G. and Govindan S. -

Neuroradiol. Sect., Univ. Maryland Hosp., Baltimore, Md. 21201 USA - COMPUT. TOMOGRAPHY 1979 3/1 (9-13)

A case of undifferentiated astrocytoma with rapid increase in size of the tumor as documented by sequential computer assisted tomography (CAT) of the head is reported. The case also demonstrates the sensitivity of computer assisted tomography in the detection of intracranial pathology, in the presence of false localizing neurological findings.

3763. Computed tomography of isodense subdural hematomas - Zilkha A. and Faegenburg D. - Dept. Radiol., Nassau County Med. Cent., East Meadow, N.Y. 11554 USA - COMPUT. TOMOGRAPHY 1979 3/1 (29-32)

Eight cases of isodense subdural hematomas were evaluated by computed tomography (CT). CT demonstrated varying degrees of compression of a lateral ventricle, shift of the midline structures and, in some cases, obliteration of the subarachnoid sulci on the side of the lesion. Contrast enhancement was helpful in 1 case and demonstrated medial displacement of enhanced cortical margins away from the inner table of the skull. Two of the 8 patients had no clear history of trauma.

3764. Pitfall in the CT diagnosis of abdominal abscess:

the full stomach - Daffner R.H. and Halber M.D. - Dept. Radiol., VA Hosp., Durham, N.C. 27705 USA - COMPUT. TOMOGRAPHY 1979 3/1 (33-36)

A case is presented to illustrate that the CT appearance of the unenhanced full stomach may be misinterpreted as an abdominal abscess in the appropriate clinical setting. The need for administering oral contrast material prior to the study is emphasized.

3765. Imaging of the pancreas with computed tomography - Raptopoulos V. and Schellinger D. -

Dept. Radiol., Georgetown Univ. Hosp., Washington, D.C. 20007 USA - COMPUT. TOMOGRAPHY 1979 3/1 (37-47)

In this paper the authors present their experience with computerized tomographic imaging of the pancreas, both in normal and abnormal conditions. Eighty patients were studied for evaluation of pancreatic disease. A further 50 patients, all with a normal pancreas, were studied for abnormalities of other abdominal organs and served as the control group. Helpful signs in establishing the diagnosis of carcinoma of the pancreas were mass effect within the pancreas, alteration of organ contour and obliteration of retroperitoneal fat planes. The authors found that differentiation from pancreatitis or retroperitoneal lymphadenopathy may at times be difficult. Their results showed that in 22 out of 23 patients with proven normal pancreas, the pancreas size on the CT display was within the adopted normal range. In 30 patients with proven carcinoma of the pancreas, a pancreatic mass was seen in 25 (83%). Computerized tomography is clearly a valuable method for viewing both normal pancreatic anatomy and anatomical variations and pathologies.

3766. Application of the ACTA-Scanner to visualization of the spine - Ledley R.S., Park C.M. and Ray R.D. - Dept. Physiol. Biophys., Med. Computing Biophys. Div., Georgetown Univ. Med. Cent., Washington, D.C. 20007 USA - COMPUT. TOMOGRAPHY 1979 3/1 (57-69)

The development of a new computer program called VISUAL, designed to be applied to a series of cross-sectional ACTA scans of the body, makes possible the three-dimensional visualization of spinal structure without the necessity of surgical exploration. With VISUAL, a molded three-dimensional image of the spine can be displayed on a CT scanner monitor from any of several angles, or from several angles successively with the direction of illumination determined by the operator.

3767. Gradient pattern coding - An application to the measurement of pneumoconiosis in chest X rays - Jagoe J.R. - Div. Med. Comput., Clin. Res. Cent., Harrow HA1 3UJ GBR - COMPUT. BIOMED. RES. 1979 12/1 (1-15)

A method of coding the patterns formed by the directions of the grey level gradient vector in neighbouring cells is described. The number of possible patterns is large, but by considering as identical those patterns which are rotationally or reflectionally isomorphic, the possibilities are reduced. It is shown that the frequency distribution of patterns in the lung fields of chest X rays is closely related to the severity of pneumoconiosis as assessed by radiologists. Specific gradient patterns which correlated best with the radiological assessment on a set of training films are identified and used to make an automatic classification of a larger test set of films.

3768. Recognition and differential diagnosis of enlarged extraocular muscles in computed tomography - Trokel S.L. and Hilal S.K. - Dept. Clin. Ophthalmol., Coll. Phys. Surg., Columbia Univ., New York, N.Y. USA - AM. J. OPHTHALMOL. 1979 87/4 (503-512)

We found enlargement of the extraocular muscles in 70 patients out of 603 orbit studies, of whom 310 had

exophthalmos. The majority (46 of 70) had the eye signs of Graves' disease. Arteriovenous malformations and carotid cavernous fistulas can cause enlargement of the extraocular muscles by a diffuse increase in orbital venous pressure. Acute orbital myositis can be distinguished from other forms of pseudotumor by the presence of a single enlarged extraocular muscle with associated inflammatory findings which responds to corticosteroid therapy. Neoplasm may invade extraocular muscles or compress their venous drainage causing secondary muscle enlargement. In all these patients the presence of a mass was correctly identified. The ability of the computed tomography scanner to recognize abnormalities of the extraocular muscles represents a significant advance in classification and diagnosis of the causes of exophthalmos.

3769. Performance evaluation of computed tomography scanners using a phantom model - Bellon E.M., Miraldi F.D. and Wiesen E.J. - Dept. Radiol., Case West. Reserve Univ., Cleveland, Ohio 44109 USA - AM. J. ROENTGENOL. 1979 132/3 (345-352)

A phantom was designed to test computed tomography (CT) scanner performance relative to spatial resolution, contrast resolution, field uniformity, spatial linearity, artifact resistance, and radiation dose. Translate/rotate, stationary detector with rotating X-ray tube, and rotate-only scanners were tested under conditions that produced the best possible results for each machine within dose ranges used in clinical practice. Machines can be ranked according to results for each parameter tested. The range of performance exhibited on machines tested was unrelated to class of scanner. Further, machine dedication to a particular body region did not necessarily secure superior results for that region. Spatial resolution at low contrast levels (poor on most machines) seems to be the most sensitive test of performance.

3770. Use of computerized axial tomography (CAT scan) in evaluating therapy of orbital pseudotumor - Hurwitz B.S. and Citrin C.M. - Dept. Ophthalmol., Washington Hosp. Cent., Washington, D.C. USA - ANN. OPHTHALMOL. 1979 11/2 (217-221)

Two patients with orbital pseudotumor, demonstrated by computerized axial tomography (CAT scan), are presented. This radiological technique was further used to demonstrate complete resolution (Case 1) and marked regression (Case 2) of the orbital masses after steroid therapy. CAT scan characteristics of orbital pseudotumor are discussed and contrasted with the findings in thyroid ophthalmopathy. It is the authors' recommendation that patients with CAT scan and clinical characteristics of orbital pseudotumor should be treated with systemic steroids and resolution of the inflammatory lesion should be corroborated by a repeat scan in atypical cases. Orbital surgery and other invasive studies should be used in those patients in whom there is no objective improvement in the disease process.

3771. Differential-diagnostic problems with the brain abscess in axial computerized tomography (Germ) - DIFFERENTIALDIAGNOSTISCHE PROBLEME

MIT DEM HIRNABSZESS IM
COMPUTERTOMOGRAMM - Schmitt H.P. - Inst.
Neuropathol., Univ. Heidelberg GFR - FORTSCHR.
NEUROL. PSYCHIATR. IHRER GRENZGEB. 1979
47/3 (158-162) - summ in ENGL

On the base of three autoptically controlled cases with ring-shaped findings in the CT the problem of the differential diagnosis of the brain abscess in axial computerized tomography is discussed. A brain abscess must especially be taken into account when the hyperdense anulus already occurs without enhancement by contrast media. The ring-shaped finding is then caused by the high amount of collagen fibres within the abscess membrane, which has no comparable correlate in other focal processes of the brain.

3772. Computer-assisted liver-mass estimation from gamma-camera images - Elkmann E.A., Mack G.A., Jain V.K. and Madden J.A. - Univ. South Florida, Tampa, Fla. USA - J. NUCL. MED. 1979 20/2 (144-148)

The authors have devised a computer-assisted method for objective estimation of liver mass from the right lateral projection of radiocolloid images of the liver. Gamma-camera images were digitized, preprocessed, and stored in computer memory. The definition of liver for area measurement was adaptively determined by means of a Laplacian operator that measures change in radioactivity slope associated with the liver margin. Individual thresholds were calculated for each of 16 subregions. A liver-mass index was derived from a linear regression model correlating the area of the right lateral projection with liver weight at autopsy in 50 patients whose livers weighed between 0.8 to 3.0 kg. The correlation coefficient found for this method was 0.83 using the equation: Liver Mass [kg] = Area [cm²]/275 [kg/cm²] - 0.215 [kg]. Liver-mass estimates using an alternative computer-assisted method or representative manual methods adapted for gamma-camera images showed lower correlation with liver weight at autopsy.

3773. Computed tomography of bladder: Staging of bladder cancer using low density opacification technique - Hamlin D.J. and Cockett A.T.K. - Dept. Radiol., Univ. Rochester Sch. Med. Dent., Rochester, N.Y. USA - UROLOGY 1979 13/3 (331-334)

In the course of computed tomographic (CT) evaluations involving 200 patients with suspected pelvic disease we have found that scan quality is often suboptimal. A preliminary report employing a low density bladder opacification method is presented whereby an indwelling catheter is inserted to control bladder volume and facilitate the instillation of low density iodinated contrast agent (0.65 Renografin-60). The patient remains supine throughout the twenty-five-minute procedure. Observations during the CT staging and follow-up of a controlled group of 8 patients undergoing immunotherapy and/or radiation therapy for bladder carcinoma indicate that this is a simple, safe, and effective procedure. We have obtained reliable clinical-radiologic-pathologic correlation as a result of careful surgical staging and biopsy, followed by open surgery and full pathologic examination. It is hoped that this information will help

initiate other similar studies to determine the diagnostic accuracy of this method and thus its use in pretherapeutic evaluation of the bladder-lesion and its subsequent response to treatment.

3774. Value of computed tomography in the diagnosis and management of subarachnoid hemorrhage - Modesti L.M. and Binet E.F. - Dept. Neurosurg., State Univ. New York, Upstate Med. Cent., Syracuse, N.Y. USA - NEUROSURGERY 1978 3/2 (151-156)

The diagnostic value of computed tomography is analyzed in 31 patients with documented spontaneous subarachnoid hemorrhage. In 50% of all cases, the computed tomogram confirmed the presence of subarachnoid hemorrhage. This figure rose to 68% for cooperative patients examined within 24 hours of their ictus. With enhanced tomography the responsible aneurysm was identified in 30% of the cases. The distribution of the subarachnoid hemorrhage correctly predicted the location of the aneurysm in an additional 35%. Intracerebral or intraventricular hemorrhages were present in 35%. They occurred most frequently within the first 24 hours, were most commonly associated with ruptured anterior communicating aneurysms, and carried a poor prognosis. Cerebral infarction was demonstrated in five patients. Ventricular dilatation was present in 11 (63%) of the 19 patients who were examined during the first 24 hours after the hemorrhage. Seven patients showed progressive hydrocephalus on serial scanning. Shunting before aneurysm surgery was required in four cases. Computed tomography is the procedure of choice for the detection of intracerebral and intraventricular hemorrhage and cerebral infarction; it is superior to angiography in this respect. Computed tomography is also helpful in detecting the presence of subarachnoid hemorrhage and determining ventricular size. Frequently the offending aneurysm can be identified or its location can be accurately predicted, allowing more effective management. The authors recommend that a computerized tomographic scan be performed (preferably within 24 hours of the ictus) on all patients suspected of having had a subarachnoid hemorrhage. The studies should be done before and after enhancement with a contrast medium.

3775. Stereotactic surgery with image processing of computerized tomographic scans - Penn R.D., Whisler W.W., Smith C.A. and Yasnoff W.A. - Dept. Neurosurg., Rush-Presbyterian-St. Luke's Med. Cent., Chicago, Ill. USA - NEUROSURGERY 1978 3/2 (157-163)

The three-dimensional information from computerized tomographic scans has been transformed by image processing for use in stereotactic surgery. A lateral image of the target and calvarium can be superimposed on the lateral x-ray film taken at operation. Computer processing also eliminates extraneous data on the scan and gives the precise distance of the target from the midline. Testing the technique on a phantom shows it to be accurate to better than 0.5 cm. Application of the method for the stereotactic biopsy of a deep tumor is illustrated.

3776. Computed tomographic evaluation of abdominal

and pelvic abscesses - Callen P.W. - Dept. Radiol., Univ. California Sch. Med., San Francisco, Calif. 94143 USA - RADIOLOGY 1979 131/1 (171-175)

The CT characteristics of abdominal and pelvic abscesses in 29 patients were analyzed. The pathological development of an abscess as it related to the CT appearance is discussed. Findings such as low-density areas within a soft-tissue mass or a definable wall or rim, while seen in abscesses, can be seen in other pathological entities as well, such as hematomas, noninfected inflammatory masses, and cystic or necrotic tumors. The most specific CT sign of an abscess was extraluminal gas, seen in 38% of patients.

3777. Real-time computer verification for radiation therapy treatment machines - Sternick E.S., Berry J.R., Curran B. and Loomis S.A. - Dept. Therapeut. Radiol., Dartmouth Hitchcock Med. Cent., Hanover, N.H. 03755 USA - RADIOLOGY 1979 131/1 (258-262)

A computer based verification system which monitors the operation of a 4-MV linear accelerator is described. Fourteen parameters can be checked for proper alignment prior to irradiation. A training simulator was also built to minimize interference with treatment schedules and to provide technicians with experience in using the system during the development stages of the project.

3778. The use of computerized tomography in the diagnosis of cerebral hydatid cysts - Ozgen T., Erbenli A., Bertan V. et al. - Dept. Neurosurg., Hacettepe Univ. Sch. Med., Ankara TUR - J. NEUROSURG. 1979 50/3 (339-342)

Eleven cases of cerebral hydatid cyst, diagnosed by computerized tomography (CT), are presented. The importance of CT in minimizing the possibility of accidentally tapping or tearing the cyst membrane is stressed. Repeat CT scanning after removal of the cyst revealed atrophy in the affected hemisphere.

3779. Betatron electron beam characterization for dosimetry calculations - Steben J.D., Ayyangar K. and Suntharalingam N. - Dept. Radiat. Ther., Thomas Jefferson Univ., Philadelphia, Pa. USA - PHYS. MED. BIOL. 1979 24/2 (299-309) - summ in GERM, FREN

Parameters have been specified for electron beams with energies 5-45 MeV from a Brown Boveri betatron for use in computerised dosimetry calculations. A semi-empirical equation is given for the dose at any point in various depths in water. This equation is a modification of Kawachi's predictive model which was based on solutions of a general age-diffusion equation. The depth doses and isodose curves are predicted as a function of the practical range, source skin distance (SSD) and field size. Depth dose accuracy requirements of $\pm 2\%$ above 50% depth dose and $\pm 5\%$ at lower doses, relative to maximum dose, have been set and achieved. Further, the shape of the isodose curves with the constrictions at higher doses and bulging at lower values are accurately predicted. Computer calculated beams have been used to generate summed isodose distribution for certain clinical situations.

3780. Post-reconstruction method for beam hardening

in computerized tomography - Nalcioglu O. and Lou R.Y. - Dept. Radiol. Sci., Univ. California, Irvine, Calif. 92717 USA - PHYS. MED. BIOL. 1979 24/2 (330-340) - summ in GERM, FREN

A method for correcting the beam hardening artefacts in computerised tomography is introduced. After an initial reconstruction of the object the uncorrected image is used to estimate the amount of bone and tissue along each ray. The bone and tissue lengths obtained from the initial reconstruction are used to add a correction term to each original projection. A second reconstruction using the corrected projection data yields the final beam hardening corrected image. The results are presented showing the application of this formalism to a mathematical phantom. The instability of the correction method with respect to various possible sources of error is examined.

3781. CT scanning after drainage of subdural haematoma: an unusual case - Kaufman H.H. and Handel S.F. - Div. Neurosurg., Univ. Texas Med. Sch., Houston, Tex. USA - ACTA NEUROCHIR. 1979 45/3-4 (217-224)

A unique patient with bilateral subdural haematomas with localized subdural membranes on one side is reported. Serial CT scans suggested that the membranes resolved spontaneously after drainage of the haematoma. The pathophysiology of subdural haematoma and the value of CT scanning in postoperative follow-up are discussed, especially in regard to learning more about the optimal treatment in this still somewhat enigmatic problem.

3782. The potential resolution of a ^{137}Cs computerized tomographic scanner for radiotherapy planning - Grindrod S.R. - Dept. Med. Phys., Royal Postgrad. Med. Sch., London, W12 0HS GBR - BR. J. RADIOL. 1979 52/616 (322-324)

If (^{137}Cs) is used to delineate cross-sectional tissue structure for radiotherapy treatment planning, avoiding excessive dose to the patient and a source so active that shielding becomes a problem, a spatial resolution of about 0.5 cm may be achieved. This would be adequate for treatment planning, since the position of a contour representing a change in linear attenuation coefficients covering a number of pixels could be defined with a greater accuracy than the 0.5 cm. The effect of inaccuracies in the position of edges and inhomogeneities on tumour and normal tissue dose would be acceptably small. Also, the relative positions of critical organs could be obtained by tomography with an accuracy which would provide treatment plans of greater clinical value than some presently accepted.

3783. Local versus global decisions in image recognition - Kovalevsky V.A. - Inst. Cybernet., 252207 Kiev UKR - PROC. IEEE 1979 67/5 (745-752)

This paper discusses the ways of finding consistency between the well-known statistical statement that 'guessing destroys information' and the practically obvious advantage of hierarchical decisions. Certain nonstatistical sources of recognition errors are indicated, the influence of these sources increasing

with the size of the image parts on which the first-stage discrete decisions are taken. The rejection criterion is examined from the statistical point of view and the necessity of mathematical models for all images to be rejected is demonstrated. The analysis of the possibilities for developing models of both images to be recognized and to be rejected leads to the conclusion that image recognition should be realized by hierarchical systems. An example of a working hierarchical recognition system for interpretation of handmade drawings is described.

3784. Basics of cellular logic with some applications in medical image processing - Preston K. Jr., Duff M.J.B., Levialdi S. et al. - Dept. Electr. Engin., Carnegie-Mellon Univ., Pittsburgh, Pa. 15213 USA - PROC. IEEE 1979 67/5 (826-856)

Cellular logic operations (CLO's) are performed digitally to transform an array of data $P(I, J)$ into a new data array $P'(I, J)$. The value of each element in the new array is determined by its value in the original array and the original values of its nearest neighbors. The neighborhood configuration (tessellation) is usually called the 'cell'; whence the term 'cellular logic'. CLO's may be categorized according to the tessellation in which they are embedded and according to the type or types of CLO sequences: Sequences which are carried out in a single step; those which iterate the same CLO for many steps; those which repetitively alternate subsequences of CLO strings. The effect of the CLO sequence on the contents of the data array is frequently one of boundary modification. Depending on the CLO sequence(s) utilized, a boundary may be expanded to form the convex hull, or reduced so as to form the convex kernel, skeleton, or residue. As of 1977, cellular logic computers have become a commercial product in biomedical image processing where they are used in clinical instruments whose purpose is to classify white blood cell images at rates of several thousand per hour. Many other applications are foreseen and, as further examples, preliminary results in automatic X-ray image analysis and tissue image analysis are presented.

9.8. Medical record documentation

3785. The computerization of histopathological data in toxicological laboratory studies using SNOP - Naylor D.C. - Pathol. Dept., Pfizer Res. Cent., 37400 Amboise FRA - METHODS INF. MED. 1978 17/4 (272-279) - summ in GERM

A computerized system, based on the Systematized nomenclature of pathology (SNOP), for the recording, storage and retrieval of histopathological findings in animal toxicity studies, is described. The system is novel in that every diagnostic term used is given a precise definition agreed upon by the pathologists concerned, and which can be revised whenever necessary. It has resulted in standardization of terminology, greater speed in association with improved accuracy and presentation of reports, and the establishment of a data bank from which in-house values can be readily retrieved. Finally, it has led to an enormous saving in the time of both pathologists and secretaries.

3786. Computerized newborn intensive care data recording and reporting. II. An online system - Janik D.S., Swarner O.W., Henriksen K.M. and Wyman M.L. - Dept. Neonatol., Univ. Utah Med. Cent., Salt Lake City, Ut. 84132 USA - J. PEDIATR. 1979 94/2 (328-330)

The authors have recently reported a computerized system for recording and reporting data on high-risk newborn infants that substantially reduced data base error and medical staff paperwork time through automatic computer-production of discharge summaries and letters to community physicians and agencies. Of remaining errors, 64% were attributable to transfer of data onto computer cards (keypunching) prior to entry into the computer. In addition, special computer programs had to be created each time information was requested from the computer for research or administrative purposes. Over 80% of reported system operation cost was attributable to keypunching and this method of data abstraction. To address these problems, an 'online' computer system, in which data may be entered onto and recovered directly from the computer by medical staff without the need for keypunching or computer specialists, was developed.

3787. Data management for a large collaborative clinical trial (Cass: Coronary artery surgery study) - Kronmal R.A., Davis K., Fisher L.D. et al. - Coordinat. Cent. Collaborative Stud. Coronary Artery Surg., Univ. Washington, Seattle, Wash. 98105 USA - COMPUT. BIOMED. RES. 1978 11/6 (553-566)

The data collection and quality control system for the Collaborative Study of Coronary Artery Surgery (CASS) is described. A special feature of the CASS system is that data at the sixteen clinics are keyed directly into a programmable terminal and later transmitted over telephone lines to the data collection center. This system is compared with the traditional data collection system of mailed paper forms.

3788. Systemic lupus erythematosus in the older age group: Computer analysis - Dimant J., Ginzler E.M., Schlesinger M. et al. - Rheumatol. Sect., Dept. Med., State Univ. New York Downstate Med. Cent., Brooklyn, N.Y. USA - J. AM. GERIATR. SOC. 1979 27/2 (58-61)

A computer analysis was made of the data from a prospective study of the clinical course of systemic lupus erythematosus (SLE) in 234 patients followed for an average of 46 months. All fulfilled four ARA criteria for the diagnosis of SLE. Sixteen of the 234 patients were aged 51 or older. They were compared with the 218 younger SLE patients to determine the influence of age on the signs and symptoms of the disease, the organ systems involved, the laboratory data, amount and duration of corticosteroid or azathioprine therapy, and the prognosis. The older group showed more discoid lupus, photosensitivity and pulmonary fibrosis than did the younger group, but a similar incidence of malar rash, alopecia, arthritis, arthralgia, myalgia and serositis, and a lower incidence of oral ulcers, Raynaud's phenomenon, cutaneous vasculitis, neuropsychiatric manifestations, leukopenia, hypocomplementemia and profuse proteinuria. The

older patients needed a low dosage of corticosteroids, and a shorter course of azathioprine therapy. These findings suggest a milder form of SLE with better response to the therapy in the older age group.

3789. MUMPS applications in doctor's office systems - Geiss E. - Zent. Inst. Kassenarztl. Versorg., Cologne GFR - MED. INFORM. 1979 4/1 (61-66) - summ in FREN

As basic elements of an information network in ambulatory care, doctor's office computers are currently being tested in various hardware and software configurations. MUMPS has proved to be most effective in developing complex text-oriented application packages on small-scale computers. Separation of program and text modules increased the flexibility necessary to serve different medical specialities. The final goal of the project is improved economic and organizational efficiency in the management of ambulatory care.

9.10. Function tests and techniques

3790. Artificial induction of labor. Role of the automatic infusion system of A.C. Turnbull. A 122-case study (Fren) - L'INDUCTION ARTIFICIELLE DU TRAVAIL. 2. PLACE DE 'L'AUTOMATIC INFUSION SYSTEM' DE A.C. TURNBULL. A PROPOS DE 122 OBSERVATIONS - Bremond A., Rudigoz R.C., Dominici J. and Magnin P. - Clin. Gynecol., Hop. Edouard-Herriot, 69374 Lyon Cedex 2 FRA - REV. FR. GYNECOL. OBSTET. 1978 73/12 (749-755) - summ in ENGL, GERM

The authors report on a series of 122 inductions of labor using an automatic oxytocic perfusion apparatus developed by Turnbull. This device is remarkably effective: only 2.4% of failure, and the labor induced is much shorter than with traditional starting means. While the frequency of anomalies of uterine activity (55.8% of cases) and anomalies of the fetal heart beat (46.8%) is high, true fetal distress is rare (1.6% of cases) and the rate of caesareans is 4.2%. This apparatus requires strict surveillance of the intra-uterine pressure and permanent fetal monitoring.

3791. Computer analysis of nocturnal tooth-contact patterns in relation to bruxism and mandibular joint dysfunction in man - Trenouth M.J. - Univ. Manchester Turner Dent. Sch., Manchester M15 6FH GBR - ARCH. ORAL BIOL. 1978 23/9 (821-824)

Bruxism is defined in terms of tooth contacts and is quantified by number, duration and distribution of these contacts. Overnight recordings were performed using stainless steel bands on opposing incisor teeth as electronic contact switches. Computer analysis of the recordings showed a significant difference between the tooth contacts in control subjects and in patients with clinical signs of bruxism combined with mandibular joint dysfunction. The pattern of tooth contacts throughout the night also differed in the two groups. The control subjects showed regular peaks at 90-60-min intervals, whereas the patients showed an irregular cycle. It is postulated that stress and disturbed sleep could account for these findings.

3792. Use of automatic computers in the dispensarization of subjects with chronic pulmonary disease (Czech) - Munzova-Jenickova J. CSK - LEK. TECH. 1978 NO. 4 (77-80) - summ in ENGL, RUSS

The author describes a method developed and experience gained in the course of six years with a group of 4000 subjects at one Prague polyclinic. After initial methodological and working problems clerical work made by health workers proved effective and improved the standards. The author mentions briefly the difficulties and obstacles which were associated with the use of a computer. The results of the experiment are to serve as a model for other polyclinics and later for other types of dispensarization.

3793. Automated phakotomy and aspiration of soft congenital and traumatic cataracts - Cohen S.W., Kara G., Rizzuti A.B. et al. - Dept. Ophthalmol., New York Eye Ear Infir., New York, N.Y. USA - OPHTHALMIC SURG. 1979 10/2 (38-45)

The design and operation of an automated instrument for removal of a soft cataract through a small corneal incision has been described in a small series of young patients. The distinct advantages of the instrument and technique are the small single-entry corneal incision, the minimal manipulation on the part of the surgeon, the relative constancy of both the anatomical shape of the globe and of a predetermined intraocular pressure during the procedure, a decreased inflammatory response, and a rapid wound healing.

3794. Computed resolution and relative specific radioactivities of radiolabelled proteins synthesized by isolated gastric mucosal cells - Trotman C.N.A. and Greenwell J.R. - Dept. Physiol., Med. Sch., Univ. Newcastle upon Tyne, NE1 7RU GBR - BIOCHEM. J. 1979 178/1 (159-164)

By radiolabelling, polyacrylamide-gel electrophoresis in the presence of sodium dodecyl sulphate and fluorography, more than 50 soluble proteins in the molecular-weight range 15000-100000 were shown to continue to be synthesized after cells had been isolated from rat gastric mucosa. Densitometric measurements of stained gels and fluorographic films were processed by computer to resolve individual overlapping Gaussian peaks corresponding to the protein bands. Comparison of resolved peak areas of radioactivity and staining showed certain bands to have characteristically high relative specific radioactivities. The computer programs (in FORTRAN) permit the analysis of a single densitometric trace or the simultaneous comparison of a corresponding pair of densitometric records of stained gels, or of fluorographic films, or a combination. Central processing unit time is used economically. The programs identify the Gaussian components that contribute to the records and estimate their means, standard deviations and enclosed areas. These estimates are improved by a piecewise iterative method that minimizes the errors between the calculated and the experimental data. Relative specific radioactivities are calculated as the normalized ratio of the area of a fluorographic film peak and the area of the corresponding stained gel peak. The computer programs have been deposited as Supplementary

3795. A self-improving quadratic tutor - O'Shea T. - Computer Based Learning Project, Dept. Computer Studies, Univ. Leeds GBR - INT. J. MAN-MACH. STUD. 1979 11/1 (97-124)

A self-improving quadratic tutor comprising two principal components is described. One component is an adaptive teaching program where the teaching strategy is expressed as a set of production rules. The second component performs the self-improving function of the system by making experimental changes to the set of production rules. This component employs a deduction procedure which operates on a theory of instruction expressed as a set of modally qualified assertions. These assertions relate educational objectives to modifications which can be made to teaching strategy. The cycle of operations proposed for the system is as follows - select an educational objective, make an experimental change in teaching strategy, statistically evaluate the resulting performance, and update both the set of production rules and set of assertions. The tutor taught the solution of quadratic equations by the discovery method. The tutor was used by 51 students, and executed five experimental changes on its teaching strategy. This trial demonstrated that it was capable of improving its performance as a result of experimentation. Its limitations include a vulnerability to problems of local optima during 'hill-climbing' and to a variant of the frame problem.

9.10.1. Blood circulation

3796. A microcomputer-based stimulator for clinical and experimental investigations in cardiac electrophysiology - Billette J., Guardo R., Bertrand M. et al. - Progr. Genie Biomed., Ec. Polytechn., Univ. Montreal CAN - PACE 1979 2/1 (20-27)

A cardiac stimulator is described which combines the ease of operation required in clinical investigations, particularly endocavitary studies of cardiac arrhythmias, and the versatility needed in a research context. This instrument uses a microcomputer to control two independent optically-isolated stimulation ports which can be addressed either independently or jointly to stimulate at two different sites. The main software module operates as a cascade of ten real time pulse generators with individually presettable parameters: amplitude, duration, period, initial delay, periodic and cyclic modifiers, triggering mode, etc. A simple interactive procedure allows the operator to define a stimulation protocol either by accessing the generator structure directly, or by calling any of five preprogrammed stimulation protocols. With this combination, the instrument can provide a large variety of pulse patterns. The operator can intervene at any time during stimulation to change parameter values or modify the pulse pattern. Concurrently with stimulation, the instrument generates time-codes to help relate cardiac responses recorded on paper chart

and magnetic tape, and reference them to specific events. The instrument can be readily expanded by the addition of parallel microprocessor modules; other real time tasks such as acquisition and processing of cardiac responses can thus be incorporated.

3797. Comprehensive cardiac pacemaker information system: Basis for a regional follow up network - Hanson J.S. and Grant M.E. - Cardiol. Unit, Dept. Med., Univ. Vermont Coll. Med., Burlington, Vt. USA - PACE 1978 1/3 (327-334)

The capabilities of a mini-computer-oriented permanent pacemaker information system are described. Extensive patient and pacer functional data are maintained in readily accessible files which may be displayed on a CRT terminal or printed out. Selective sorting of stored information may be accomplished according to any desired set of inclusive or exclusive criteria. Intelligent, comprehensive patient follow-up has been greatly facilitated through application of the system. In view of the rapidly expanding pacemaker population, it is suggested that cooperative regional networks operating with comparable information storage and retrieval structures will provide the only means for adequate patients surveillance and compilation of necessary pacemaker data.

9.10.3. Nervous system

3798. A trial production of an experimental system in which a microprocessor is applied for automatic controlling and analysing animal learning behaviors (Japa) - Miyake H. and Ikeda T. - Dept. Publ. Hlth, Sapporo Med. Coll., Sapporo JPN - SAPPORO MED. J. 1978 47/5 (510-516) - summ in ENGL

Application of behavioral techniques to the assessment of environmental pollutants was recently proposed. Since 1974, we have been studying the effects of some environmental pollutants on operant learning behaviors in the rat. Behavioral toxicological experiments generally produce massive data, therefore necessity compelled us to devise an automatic data processing system for the improvement of efficiency. In this paper, a trial production of equipment to which a microprocessor is applied for the automatic controlling of four Skinner boxes and for automatic analysis of the data is described. A trial run gave satisfactory results. Studies on dose-response relationship, at a four dose level, became possible by operating four Skinner boxes simultaneously.

3799. Automatic REM detection: Modifications on an existing system and preliminary normative data - Ktonas P.Y. and Smith J.R. - Dept. Electric. Engin., Cullen Coll. Engin., Univ. Houston, Tex. 77004 USA - INT. J. BIO-MED. COMPUT. 1978 9/6 (445-464) - summ in FREN

This paper describes hardware changes and additions to a previously reported sleep rapid eye movement (REM) automatic detection system. Specifically, it describes the design philosophy of a new and optimum analogue bandpass prefilter, new detection criteria based on a detailed study of the waveform distortion due to AC coupling and bandpass prefiltering and the implementation of an artifact

detection system for a more accurate detection of seemingly REM-related electro-oculographic (EOG) waveforms. Preliminary normative data on phasic REM patterns from young adults, detected by the described system, are also presented.

3800. Peak-detection algorithm for EEG analysis - Barr R.E., Ackmann J.J. and Sonnenfeld J. - *Mechan. Engin., Univ. Texas, Austin, Tex.* 78712 USA - *INT. J. BIO-MED. COMPUT.* 1978 9/6 (465-476) - summ in *FREN*

A peak-detection method is described for computer analysis of the electroencephalogram (EEG). The technique consists of measuring the amplitude and time interval between successive maxima (peaks) and minima (troughs) in the signal. A critical feature of the peak-detection algorithm is the inclusion of an amplitude threshold criterion which eliminates the registration of low-voltage activity riding on EEG waves. The peak-detection procedure permits the formulation of a variety of intra-band and inter-band EEG statistics which can be useful in on-line computer applications. The peak-detection algorithm has been successfully applied to a number of normal and clinical EEG recordings. Although no computer procedure for EEG analysis has yet been universally adopted, the peak-detection algorithm reported in this paper presents a standardized approach which can be used between EEG clinics.

3801. The effect of potassium on the activity of auditory nerve fibers of the guinea pig cochlea - Leng G. and Comis S.D. - *Neurocommunicat. Res. Unit, Med. Sch., Univ. Birmingham GBR* - *ACTA OTO-LARYNGOL.* 1979 87/1-2 (39-46)

Scala tympani of the guinea pig cochlea was perfused with solutions having an increased potassium concentration. The response characteristics of single auditory nerve fibres in both normal and kanamycin-damaged cochleas were studied using computer controlled routines. The results indicate that these perfusions caused a marked increase in the spontaneous firing rate of auditory nerve fibres, without loss of threshold sensitivity. Current theories of cochlear transduction support the view that the potassium concentration difference across the reticular plate is fundamental to the sensitivity of the cochlea. The results presented here do not support this view.

3802. Use of a computerized information system in the management of patients with transient cerebral ischemia - Heyman A., Burch J.G., Rosati R. et al. - *Div. Neurol., Dept. Med., Duke Univ. Med. Cent., Durham, N.C.* 27706 USA - *NEUROLOGY* 1979 29/2 (214-221)

A computerized information system has been developed for storing and retrieving the clinical, demographic and laboratory data on 267 patients with transient cerebral ischemia admitted to Duke University Hospital during the past 4 years. The major objective of this computer system is to improve patient care by providing the clinician with immediate information for decision making and prognostication, based on experience with prior patients with cerebral ischemia similar to those under the clinician's care. The

data bank also provides a resource for clinical investigation for transient cerebral ischemia, and represents a repository of detailed information not available in the usual printed sources of medical instruction.

3803. Estimation of signal and noise spectra by special averaging techniques with application to a posteriori 'Wiener' filtering - De Weerd J.P.C., Uyen G.J.H., Johannesma P.I.M. and Martens W.L.J. - *Dept. Electroneurol., Radboud Hosp., Univ. Nijmegen NLD* - *BIOL. CYBERN.* 1979 32/3 (153-164)

This paper deals with the problem of separating the spectra of signal and noise in ensembles where the signal can be considered as an invariant component and the noise as a stationary additive background. Several methods are discussed and compared on the basis of a statistical analysis of the first two moments of the estimators for signal and noise spectra. As a consequence a procedure is proposed which provides a flexible compromise between estimation accuracy and computational effort. The application of this procedure to a posteriori 'Wiener' filtering is compared with a more common, but time consuming, technique.

3804. Automated perimetry - Springer D.A. and Alexander L.J. - *Sch. Optom., Univ. Alabama, Birmingham, Ala. USA* - *AM. J. OPTOM. PHYSIOL. OPT.* 1978 55/10 (725-727)

The history, theory, and practical application of automated perimetry are discussed. Optometrists are urged to consider increasing the efficiency of their examination procedures by using automated field testing - in particular, automated perimetry.

3805. An investigation of computer coaching for informal learning activities - Burton R.R. and Brown J.S. - *Bolt Beranek and Newman, Inc., Cambridge, Mass.* 02138 USA - *INT. J. MAN-MACH. STUD.* 1979 11/1 (5-24)

Computer-based tutoring/coaching systems have the promise of enhancing the educational value of gaming environments by guiding a student's discovery learning. This paper provides an in-depth view of (i) the philosophy behind such systems, (ii) the kinds of diagnostic modeling strategies required to infer a student's shortcomings from observing his behavior and (iii) the range of explicit tutorial strategies needed for directing the Tutor to say the right thing at the right time. Examples of these issues are drawn for a computer-based coaching system for a simple game: How the West was Won. Our intention in writing this paper is to make explicit the vast amounts of tutorial knowledge required to construct a coaching system that is robust, friendly and intelligent enough to survive in home or classroom use. During the past three years, we have witnessed how subtle the computer-based coaching problem really is. We hope this paper conveys some of these subtleties, many of which continue to resist general solution.

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